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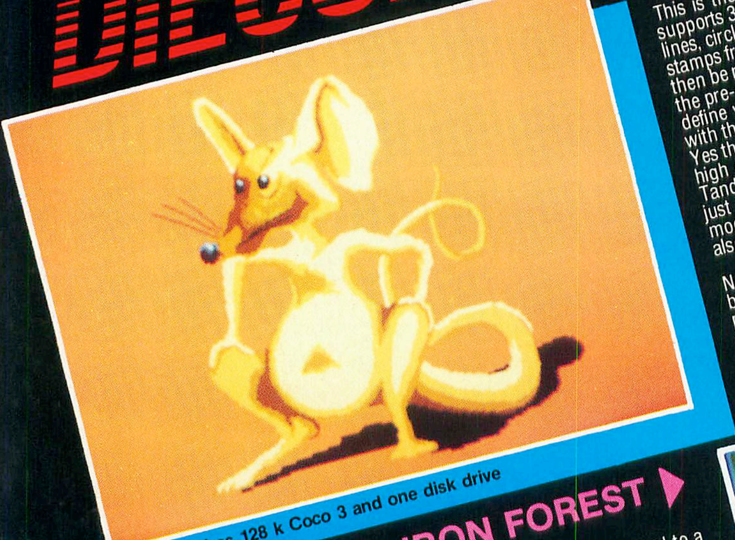

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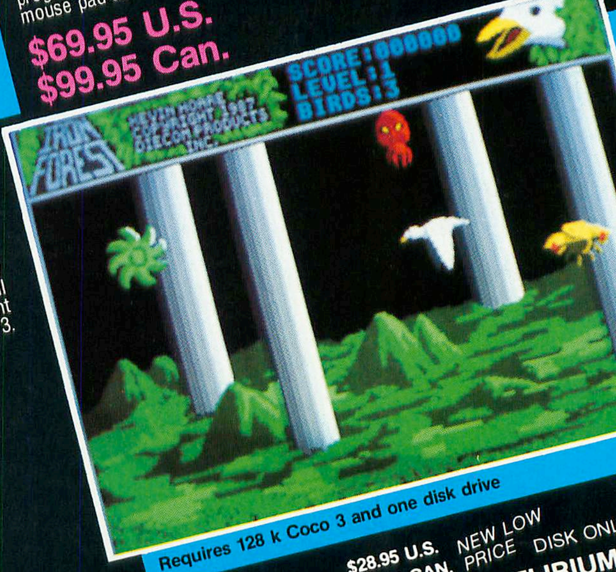

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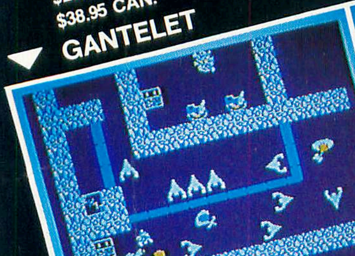

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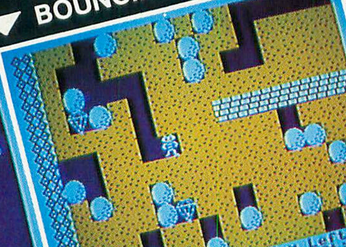

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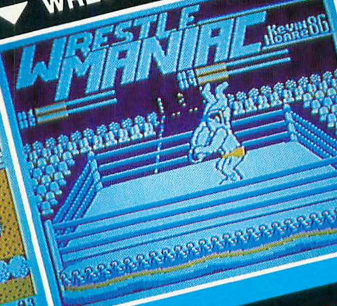

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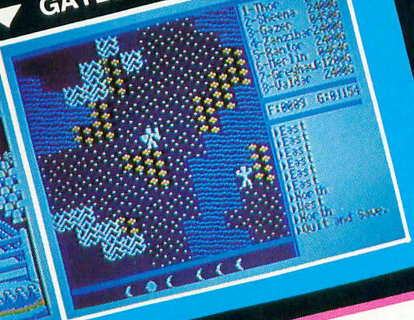

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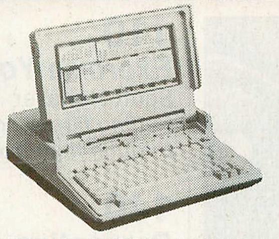

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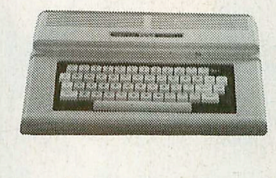

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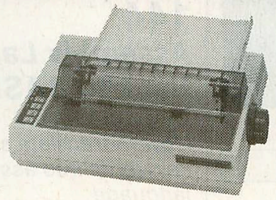

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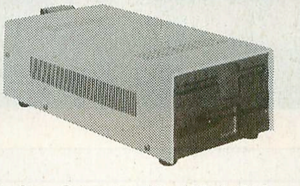

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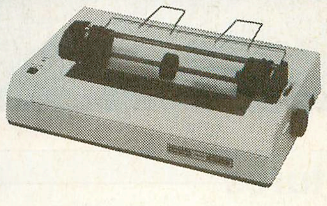

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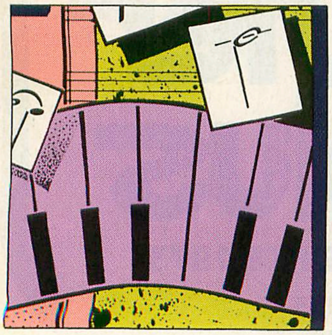

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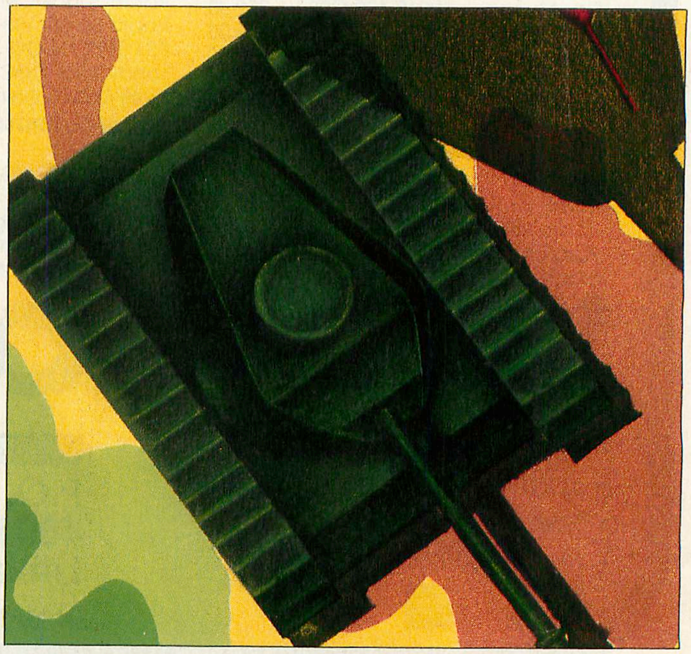

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Letters to the RAINBOW

Editor:

Lonnie Falk's reply to Alan Parker's letter in the March 1988 RAINBOW editorial has come as a welcome reassurance to the CoCo Community. Mr. Falk, through facts and figures, has dispelled the fears that the CoCo 3 might be discontinued by Tandy.

We at Microcom Software fully support Mr. Falk's views and reaffirm our dedication to the CoCo 3. We observe that the CoCo 3 is stronger than ever, and a wide variety of software and hardware is continuously added to its arsenal. During the past three months, Microcom Software has added more than 25 new products for the CoCo 3 market. We have seen an unprecedented demand for Utility software for the CoCo 3. This constant demand from our customers for newer and newer software and hardware has kept our programmers on their toes all the time.

We have also witnessed an unprecedented growth in our technical support, with the number of technical inquiries more than quadrupling in the past few months. The customers are becoming more and more knowledgeable about many aspects of the CoCo 3 — a welcome sign.

Besides the strong domestic and Canadian market, a number of overseas countries have developed strong CoCo bases. Notable among these are Australia, the largest importer of CoCo software and hardware. Other countries in Europe, the Middle East, and South and Central America have shown remarkable growth in the CoCo market.

I am sure our experience and observations are shared by most other software companies. Obviously, these cannot be the signs of a dying market.

Manohar T. Santwani
President
Microcom Software

CoCo-Commie Compatibility, Revisited

Editor:

Looking over the February issue, I noticed a letter in the "Doctor ASCII" column asking if Commodore 64 software could be run on the CoCo. I agree with Dr. ASCII's answer "Only if the program is in BASIC." However, he also mentioned "transferring the ASCII code" and "most likely requiring some modification." The truth is, the other system uses a different ASCII from that of the CoCo. The only compatibility between the two in this area is the ASCII codes 13, 34 through 91 and 94. There's also a slight "thing" about "basic tokens": different address, sound, Lo-Res as well as Hi-Res graphics. The other system can access the underlying area of memory to manipulate the character set or store some programming. It also has the capability of using the C-Block *(the area* where the ROM-Cartridge memory is in the CoCo).

The user would do better to type software in than try a transfer of anything other than text files, and he should make those modifications as he goes along.

I know a lot of the problems associated with this. I worked on one conversion program I received from a dealer who advertises in RAINBOW. Although I had a little success, I came to a blunt end and decided to write my own conversion program (*Filedata*, March '88 RAINBOW, Page 74). This was the initial steppingstone for a larger program to create dimensioned files. It was to be used for creating the files for the conversion program, but it got sidetracked and revolves around creating files for text Adventure games. It's still usable for other things, however.

Raymond Doss
Coos Bay, OR

REVIEWING REVIEWS

Editor:

Several of our customers have had trouble using the parallel printer interface described in the "Turn of the Screw" by Tony DiStefano (RAINBOW, November and December 1987).

The difficulty stems from using *VIP Writer III*, which operates the CoCo 3 at double clock speed, with the parallel interface and a printer such as the Radio Shack DWP 430. At double clock speed the strobe pulse sent to the printer is so fast the data is never seen and therefore never printed. The DWP 430 printer requires a strobe pulse width of 1.5 microseconds minimum. Compare this to an Epson JX-80, requiring a strobe pulse width of only .5 microseconds.

VIP Writer III now slows the CoCo 3 to normal speed during this time to ensure that the strobe pulse will be of sufficient width for even the DWP 430. Those who own *VIP Writer III* and are experiencing difficulty can contact us to obtain a replacement.

Those using the parallel interface with BASIC should also be aware that they might have problems printing while operating their CoCo 3s at double clock speed.

Paul Anderson
SD Enterprises
Gresham, OR

New Version of *Textform*

Editor:

As a whole, I was tremendously pleased with Mr. McGarry's review of *Textform*. However, I feel that there is need for clarification on one item. In the review Mr. McGarry states that he finds the column length parameter option "redundant." I disagree. This option was intentionally included so that it will be possible to configure formats which are either longer or shorter than the standard 66 lines per page. This would allow the user to possibly use 8½-by-7 inch fanfold paper or to use photoreduction of overlength printouts for greater page density. As is apparent by Mr. McGarry's review, he is quite impressed with the program's flexibility. This added option allows yet another means for utilizing *Textform* and the user's imagination to create truly unique two-column documents.

Mr. McGarry also commented on the program's lack of a disk directory routine. This option, along with several others, will be included in Version 1.1. All purchasers of *Textform* Version 1.0 will receive a free copy of Version 1.1 when it is released.

One item I would like to make users aware of is the fact that the Hi-Res interface is not compatible with all Hi-Res input packs. For this reason, future versions of *Textform* will not attempt to support the Hi-Res option. I sincerely hope that this will not be of inconvenience to users.

Ralph A. Dahlgren
R.A.D. Products
Jamestown, NY

HINTS & TIPS

Editor:

Thanks for all the quality programs and articles I've seen from Fred Scerbo.

However, I'd like to point out something misleading in the April "Wishing Well" column: It *is* possible to change the color set on a CoCo 3 from red to blue and vice versa. Just press F1 and the reset button simultaneously. Pressing the reset button alone sets the colors back to the original.

Brad Bansner
Wyomissing, PA

Putting It All Together

Editor:

With OS-9 Level II, the CoCo 3 with 512K and double-sided disk drives it is possible to:

1. Obtain a single disk containing all components of OS-9 Level II, BASIC09, *DynaCalc* and *Profile* with 213 free clusters, the largest a block of 191, remaining.
2. Obtain a single disk containing all components of *Mutli-Vue*, BASIC09, *DynaCalc* and *Profile* with 173 free clusters remaining.

You must back up, configure, and patch the various programs in the regular manner. Format double-sided disks to 35 tracks and type `os9gen` to create `OS9Boot` with the OS-9 Level II disk (it is not necessary to create a new boot with *Multi-Vue* as Disk 2 provides this function). Type `dsave` to save the rest of the OS-9 Level II program, or the *Multi-Vue* program, to your formatted disk.

Using your various program disks, copy those elements not already present on the OS-9 Level II or *Multi-Vue* disks.

Multi-Vue states that you should not use a customized system disk to create `BuildMV`. I used a customized disk so as to include `D0_40D`, `D1_40D` and `DDD0_40D`.

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You can save data to formatted 40-track disks.

I find using the keyboard mouse just as convenient and sometimes easier than a regular mouse.

Kenneth A. Conklin
Alpena, MI

Attention *Frantic* Fanatics!

Editor:

Frantic Fingers (January '88 RAINBOW, Page 69) was originally written for use with CoCo 1- and 2-style keyboards. The grouping of the arrow keys on the CoCo 3 makes it difficult to do well in this game, so try substituting `Z=64` for `Z=94` and `Z=189` for `Z=10` in Line 1. Now you can use the ALT key for up and the CTRL key for down. Left and right still use the left and right arrow keys.

To all you *Frantic* fanatics: I just completed Level 94. Let's see your best in RAINBOW Scoreboard!

Michael G. Toepke
Oak Harbor, WA

EDTASM+ to Disk Transfer

Editor:

I would like to pass on some information to your readers regarding *EDTASM+*. Using the program pack I typed in Roger Schrag's *Superpatch* to transfer the pack to disk. This was the first machine language program I had ever attempted, and it didn't work!

Thanks to Gordon Shephard, Sr., who wrote to "Downloads" in August 1987, I find the original is for 1.0 ROM. His corrections for the 1.1. ROM were added in, and I now have a great program that is even greater on disk.

Here is where all parts of the program can be found in RAINBOW:

September 1983, Page 66 — "Superpatch for EDTASM+"
March 1984, Page 156 — "FCC Fix for EDTASM+"
August 1987, Page 154 — "Superpatch Fixes" (1.1 ROM)

John A. Coldwell
Prince Rupert, B.C.

KUDOS

Editor:

I saw Spectro Systems' ad in RAINBOW for ADOS-3, read its review (June 1987), then decided to buy it. I just got it a few days ago . . . WOW! If anybody out there has been used to RS-DOS only (like me), I strongly recommend ADOS-3. It will knock your socks off. (Even if you have shoes on!)

Is there anybody who knows how to integrate Bangert's *Super Programming Aid* Version 3.1 with ADOS-3? I think Spectro Systems and Bangert Software Systems should get together on this one. Such an integration would bring forth a great DOS!

Frederick A. Lajoie
Middleton, Nova Scotia

An Apple for THE RAINBOW

Editor:

I have been buying RAINBOW since October 1984. From time to time I go back and read them over again. Your programs are the most important reason I buy RAINBOW. I have a 10-year-old son who uses your programs to help with his school work. He has gone from failing to a 98 average. He disliked school and did not do his homework, but now with your help he finds his schoolwork fun and interesting.

Education is very important, and your work is an inspiration to my son. Thank you so much for all your help.

Patrick Leviker
Schenectady, NY

Marty *Not* "The Mouth"

Editor:

On Page 160 of the March issue, Marty Goodman's biography calls him "sort of the Howard Cosell of the CoCo world." My impression of Howard Cosell as a verbose, monotoned commentator does not fit this caring, sensitive man whom I have had the good fortune to meet. What began as an exchange of money for monitor drivers turned into a complete sharing experience! Marty opened up his head, his heart and his home as we discussed everything from science fiction to Hebrew and theology. Oh yes, we did talk about the CoCo and RAINBOW and Delphi (including a visual demonstration).

I have enjoyed THE RAINBOW, and at least two other people have subscribed after seeing my copies. It is only right, after all, because you enjoy and employ people like Marty. But please, strike the Howard Cosell line!

The Rev. Douglas Jenkins
San Anselmo, CA

The Buck Stops . . . Where?

Editor:

I bought my CoCo nearly three years ago because it could use a standard tape player for saving and loading programs and because there was this magazine packed full of programs for it (wonder who that is!). I stayed with my black and white TV, cassette player, and 64K CoCo 2 for quite a while. I added things like a printer and modem, but I was content until I got into telecommunications. Then I wanted to run my own BBS, and that required disk drives; I bought a pair. Then I started getting these programs that used the Speech/Sound Pak, which I had, to produce sound. Now I needed a Multi-Pak, so I bought one just so I could hear the speech. I then added other hardware and eventually upgraded to a CoCo 3. With the CoCo 3 I bought a game called *Rogue*. But wait! The only way I could see the graphics on *Rogue* was to have 512K, so I bought the upgrade just to see them. I then bought OS-9 Level II because I had been using a friend's Leading Edge operating system and thought it was fun.

It's interesting to look back and see just why we buy things. I'm glad I did. And even though my system has changed over the years, there's always been one source of information to help me through — THE RAINBOW. I'd just like to say thanks for your excellent efforts and publication. You're the best!

Floyd Resler
Cincinnati, OH

PEN PALS

- I am 14 years old and have a CoCo 2, disk drive, cassette recorder and modem. I am interested in a pen pal who likes Adventures and other games.

Erik Swenson
19 Ridge Road
Enfield, CT 06082

- I am 15 years old and would like to hear from other CoCo users around my age or older. My system consists of a CoCo 2 and 3, disk drive, color composite monitor, Star NX-10 printer and an Avatex 1200 HC modem.

Dan Garvin
240 E. Ninth St.
Traverse City, MI 49684

- I would like a pen pal from anywhere. I have a CoCo 2, one disk drive and two joysticks. I am 10 years of age.

Kevin Lewis
256 Elron Circle
Thunder Bay, Ontario
Canada P7C 5T5

- I am 12 years old and want friends from all over the world. I have a CoCo 2, speed cartridge, two joysticks, LOGO, and a tape recorder. I want to hear from anyone interested in the CoCo or just wanting to talk.

Chris Phillips
4461 Steuber Rd.
Bethlehem, PA 18017

- I am 49 years old and a retired school teacher. I have a 64K CoCo, FD 501 disk drive (0 and 1), speech pack, Modemfone 100, Multi-Pak and a DMP-105. I would like pen pals anywhere in the world and will answer all letters.

Henry Witcher
6653 Columbus Circle
Ocean Springs, MS 39564

- I am a 13-year-old boy looking for a pen pal. I have a CoCo 2 with a disk drive. I enjoy playing games and Adventures. I am especially looking for a pen pal outside the U.S.A. with a CoCo 2.

Charles Bell
15515 Kendall Creek Rd.
Clinton, MT 59825

- I am 9 years old. I am looking for an American pen pal who's a girl. I have a 64K CoCo 2, two disk drives, a DWP-230 printer and two joysticks.

Angie Kenkel
4700 West A St.
Lincoln, NE 68502

BULLETIN BOARD SYSTEMS

- I need to inform the people who call my BBS about some changes. When you connect to my system, press ENTER twice to select 300 baud. You must be in 300 baud to use my system. If you already have a code, then enter it. If you don't, write to me. Call (703) 365-2018, 300 baud, 7E1 or 8N1. Monday through Sunday, 7 p.m. to 7 a.m. EST.

Ricky Sutphin, SysOp
Rt. 1, Box 20
Henry, VA 24102

- The Dayton Area Color Computer Users Group sponsors the DACCUG BBS. It features uploads, downloads and E-Mail. Available 24 hours at 300 or 1200 baud, 8 bits/no parity/1 stop bit. Call (513) 836-2741.

John Teague
Corresponding Secretary
308 Orangewood Drive
Kettering, OH 45429

- I am delighted to announce a BBS dedicated to CoCos and run on a CoCo 2 with eight drives. It is S.O.B.B.S. (Sandy Oregon B.B.S.), and the phone number is (503) 668-8397.

We welcome the public, and also have a membership access available for $5 a year. We feature not only a message base, but also a public download, membership download and online games such as *Galactic Conflict* and *Castle of Death.*

The BBS is run on *CoBBS* supporting 300/1200 baud at any parity. We are online 7 days a week, 24 hours a day.

Tom Bair
Steve Ricketts
SOBBS SysOps

- There is a super new BBS called "The CoCo Club BBS." Call (402) 375-1513 in Wayne, Nebraska. There is a direct-connect modem in use. When someone answers, ask for Nate.

Nathan Tompkins
420 Douglas
Wayne, NE 68787

- The Manton Modem BBS is now online, running at 300 baud, 7E1, 24 hours, using S.D. Roberson's *PBBS* Version 5.0 on a CoCo 2, OS-9 Level I. Call (616) 824-6026.

Carl Johnson
6030 N. 43rd.
Manton, MI 49663

- ColorWorld 2 (SysOp: Edward Gray) is online from 9 p.m. to 7 a.m. Monday through Friday, PST. Call (805) 949-1217. I am using *CoBBS* Version 1.3, running at 300 baud, at the present time. I would appreciate hearing from everyone.

Edward S. Gray
45246 No. Raysack #4
Lancaster, CA 93535

- The Bad Sector announces it supports the CoCo, running GT Powercomm. Phone: (517) 892-4881. N-8-1, 300/1200 baud, free! SysOp: Doug Stefaniak. Many CoCo files to download. Fill out the questionnaire for down and upload capability. Type `C` at the menu for a listing of all file areas. Type `Q` to fill out the questionnaire. Online 6 a.m. till 3 a.m.

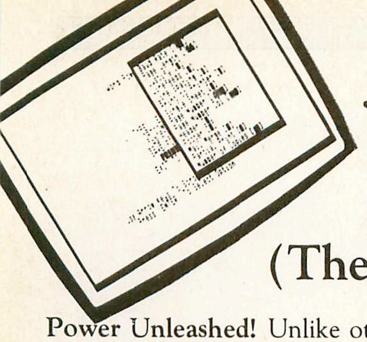
Ron Sujkowski
1806 34th St.
Bay City, MI 48708

- I am pleased to announce that Duke's Shelbyville COLORAMA is celebrating its third year of 24-hour daily operation. There are no charges to use this highly modified COLORAMA. A new user application is required to obtain access. Protocol: 300/1200 baud, 7 bit, even parity, 1 stop bit; phone (317) 392-2769.

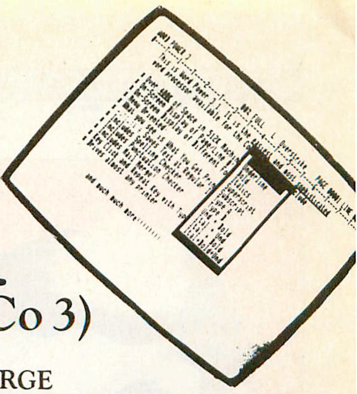
Duke Norris
P.O. Box 241
Shelbyville, IN 46176

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type `RAI` to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type `LET` to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.



Word Power 3.1



(The Ultimate Word Processor for the CoCo 3)

Power Unleashed! Unlike other word-processors, Word Power 3.1 is written from scratch for the CoCo 3. It bridges the gap between "what is" and "what should be" in word-processors. **No other word processor offers such a wide array of features that are so easy to learn and use.**

DISPLAY

The **80-column display** with true lowercase lets you view the full width of a standard page. **All prompts are displayed in plain English in neat colored windows (see display above).** The current column number, line number, page number and percentage of free memory is displayed on the screen at all times. The program even **displays the bottom margin perforation** so you know where one page ends and the other begins. You can also change foreground/background color of screen and select menu and carriage return colors to suit your needs! Carriage returns can be visible or invisible. Word Power 3.1 runs at double clock speed and can be used with RGB/composite/monochrome monitors as well as TV.

AVAILABLE MEMORY

No other word processor gives you so much memory. Word Power 3.1 gives you **over 72K** on a 128K machine and **over 450K** on a 512K machine to store text.

EDITING FEATURES

Word Power 3.1 has one of the **most powerful and user-friendly full-screen editors with word-wrap.** All you do is type. Word Power 3.1 takes care of the text arrangement. It even has a built-in **Auto-Save** feature which saves the current text to disk at regular intervals; so you know that your latest version is saved to disk. Here are some of the impressive editing features of Word Power 3.1:

Insert/Overstrike Mode (Cursor style changes to indicate mode); OOPS recall during delete; **Type-ahead buffer** for fast typers; Key-repeat (adjustable) and Key-click; Four-way cursor control and scrolling; Cursor to beginning of text, end of text, beginning of line, end of line, top/bottom of screen, next/previous word; Page up/down; Delete character, previous/next word, beginning/end of line, complete line, text before and after cursor; Locate/Replace with **wild-card search** with auto/manual replace; Block Mark, Unmark, Copy, Move and Delete; Line Positioning (Left/Center/Right); Set/Reset 120 programmable tab stops; Word count. Define left, right, top and bottom margins and page length. You can also highlight text (underline – with **on-screen underlining,** bold, italics, superscripts, etc). Word Power 3.1 even has a **HELP screen** which can be accessed any time during edit.

MAIL-MERGE

Ever try mailing out the same letter to 50 different people or sending out several resumes? Could be quite a chore. Not with Word Power 3.1. Using this feature, you can type a letter, follow it with a list of addresses and have Word Power 3.1 print out personalized letters. It's that easy!

SAVING/LOADING TEXT

Word Power 3.1 creates ASCII format files which are compatible with almost all terminal, spell-checking and other word-processing programs. It allows you to load, save, append and kill files and also to create and edit Basic, Pascal, C and Assembly files. You can select files by simply cursoring through the disk directory. Supports double-sided drives and various step rates.

PRINTING

Word Power 3.1 drives almost any printer (DMP series, EPSON, GEMINI, OKIDATA, etc). Allows print options such as baud rates, line spacing, page pause, partial print, page numbers, page number placement, linefeed option, multi-line headers/footers, right justification and number of copies (see display above). The values for these parameters and the margins can be changed anytime in the text by embedding Printer Option Codes. Word Power 3.1 has the **WHAT YOU SEE IS WHAT YOU GET** feature which allows you to preview the text on the screen as it will appear in print. You can see margins, page breaks, justification and more.

SPELLING CHECKER

Word Power 3.1 comes with a 50,000 word spelling checker/dictionary which finds and corrects mistakes within your text. You can add words to or delete from the dictionary or create a dictionary of your own.

PUNCTUATION CHECKER

This checker will **proofread your text for punctuation errors** such as capitalization, spaces after periods/commas, double words and much more. It's the perfect addition to any word processor.

DOCUMENTATION

Writing with Word Power 3.1 is a breeze. Word Power 3.1 comes with a well-written, easy-to-comprehend instruction manual which will lead you step-by-step through the program.

Word Power 3.1 comes on an UNPROTECTED disk and is compatible with RS DOS 1.0/1.1 and ADOS. Only $79.95.

(Word Power 3 owners can get the 3.1 version by sending proof of purchase and $10.00 to cover the cost of shipping and the manual.)

"I have had other programs in the past but find this the easiest to learn and use. The other programs I have used have presented problems. I just kept buying one after the other until I hit upon one that satisfied all my needs (Word Power 3.1)."

– Kenneth C. Brownson, R.N., Ph.D., Director
Health Service Education Institute

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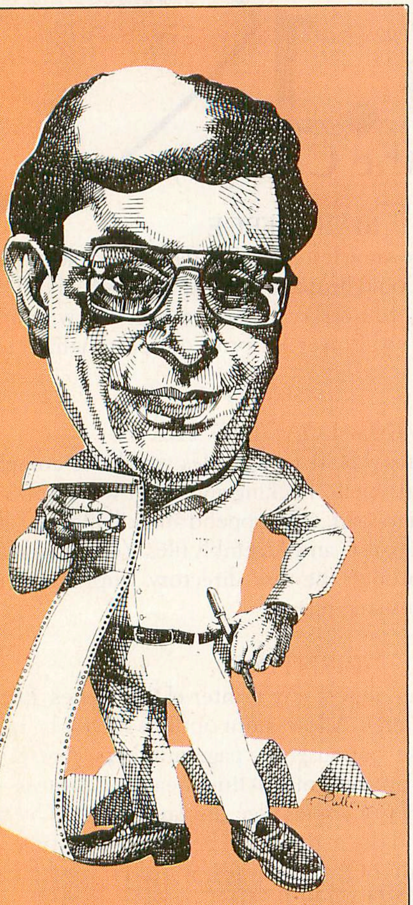

Much Ado About "The Suit"

Pardon me this month if I make a small detour from the CoCo world here. The reason is simply that there is a very big issue floating around the microcomputer world these days, and I think it deserves some mention.

There is, however, a Tandy aspect to it all. I'll get to that in a moment.

The big issue is "the suit," which is what just about everyone seems to be calling the decision by Apple Computer Co. to sue Microsoft (and Hewlett-Packard) for allegedly violating its copyright on the audio-visual display that Apple uses in its Macintosh computers.

As most of you no doubt know, Apple *popularized* (that's an important word) the concept of the graphical interface in its first Macs with the desktop concept. Now we have graphical interfaces in a number of products for the Tandy PCs and compatibles — and, of course, in the CoCo with *Multi-Vue*. In the PC world, the big *Multi-Vue*-like interface is the *Windows* program from Microsoft. H-P gets into this because it, too, has a similar type of graphical interface, called *New Wave*, ready to be shipped.

Longtime readers of THE RAINBOW will know that I have never been much of an Apple fan. Originally I thought its machines vastly overpriced (they still are), and I have always considered the Mac to be too slow to be really effective. I have, however, always admired the pioneering spirit of Steve Jobs, particularly, and Steve Wozniak in their "garage computer" development.

Tandy and Apple fought it out for years in the early days of the computer business. Each side had its fans. And the original Mac, though slower than molasses in January in Peterborough, N.H., was probably the cutest computer to come down the pike in a long time — a brainchild of Jobs himself.

It was probably what got him canned at Apple, as well. Jobs hired a guy named Vince Scully to run Apple; lo and behold, in a few years Scully took control and forced Jobs out. To my mind, that ended Apple's days of innovation.

Instead, we have marketing by threat and intimidation.

COCO 3 UTILITIES GALORE

(All utilities support 40/80 columns for CoCo 3)
(CoCo 2 versions are available for most utilities)

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Copies Basic/ML programs and DATA files. CoCo 1, 2 & 3. 32K Disk System (Disk to Disk Copy requires 64K). Disk Only **$24.95**

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Something possibly wrong with your CoCo? CoCo Checker is the answer! Will test your ROMs, RAMs, Disk Drives & Controller, Printer, Keyboard, Cassette, Joysticks, Sound, PIAs, VDG, Internal Clock Speed, Multi-pak Interface and more! **$24.95**

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An excellent utility to keep track of your bowling scores. Allows you to save scores under individuals or teams. You can edit, change, delete and compare scores. A must for anyone who wants to keep track of his or her bowling performance. Disk **$19.95** (CoCo 2 version included).

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Organize your videocassettes with this program! Allows you to index cassettes by title, rating, type, play time and comments. Also allows you to sort titles alphabetically and view/print selected tapes. If you own a VCR, this program is a must. Disk Only **$19.95** (CoCo 2 version included).

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32, 40, 80 column text dump, PMODE 4 Graphics Dump. Single Keystroke Operation allows you to take snapshots of screens even when programs are running! Works on DMP's, Epson and Gemini. CoCo 1, 2 and 3. Disk Only **$24.95**

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User friendly graphics interface with multiple "window" applications for Level II. Only **$54.95**

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Lightning Fast Ramdisk with Auto Formatting. A must for any OS9 Level II User. Req. 512K **$29.95.** (Only **$14.95** with purchase of 512K Upgrade & Ramdisk!!).

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Rainbow Guide To OS9 Level II Disk: $19.95

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See, Apple is contending that Microsoft and H-P have taken its idea of a graphical interface and stolen it for *Windows* and *New Wave*.

The suit has the industry in an uproar. And I happen to think that is just what Apple is trying to do. The company, unsuccessful in pushing any version of its Mac as an office machine — and thus losing a great deal of business to the PC field — is, I believe, hoping it will "scare off" enough people from buying PCs and using *Windows*.

Some believe the Apple suit is really aimed at IBM, which is to launch its Presentation Manager for OS/2 soon. OS/2 and *Windows* are said to be very similar. Now, if Apple can slow sales of these two graphical interfaces — which certainly make PCs easier to use — where is a body to turn? To Apple, of course.

This is what I believe to be the whole strategy behind the Apple action. I think the Scully-Apple group cannot compete with Tandy, IBM and everyone else in the big-time business marketplace; so it is trying to put a kernel of concern in the mind of PC buyers that they might be running afoul of the legal system if they use any graphical interface other than Apple's.

And how long will Apple have an advantage if its supposition is correct? Well, you know how long it takes to bring a lawsuit to trial, don't you?

So far, this whole thing has seemed to backfire on the geniuses in Cupertino. The initial reaction of pundits, regular media, the computer press, industry analysts and corporate buyers was, generally, anger. Too, most seemed to make the same general analysis as did I: That Apple, losing the battle of the marketplace, had to try something; and "the suit" was as good a tactic as any. Some say it may be the only shot Apple has left to keep a significant hold on the market into the 1990s.

> *"The biggest winner in 'the suit' just may be Tandy."*

An interesting footnote to all of this is that the first true graphical interface did not come from Apple, but from Xerox — which used a scheme called Viewpoint. Some have made the argument that Viewpoint has never been popular, while the Mac desktop "popularized" the concept; that argument just does not hold water. If it did, then the standard would have to be that a product must be a commercial success to be copyrightable, not just different.

There are a whole lot of other issues in this mish-mash. But I think one point stands clear: Apple, after years of trying, has determined it cannot penetrate the "real" computer market as Tandy, IBM and others have done.

Is this the last gasp of a once-great company? I wouldn't be surprised.

* * *

The biggest winner in "the suit" just may be Tandy. Of all the major players in the PC world, only Tandy has gone to great expense and expended great energy to develop its own interface — the popular *DeskMate*.

I use both *DeskMate* and *Windows* for different things. Tandy developed *DeskMate* originally for the 2000 to give an easy-to-use interface between its users and its computer systems. Over the years *DeskMate* has undergone numerous revisions; while not exactly a total graphical go-between, it does most of the things a graphical interface does — at considerably less cost and with a lot less learning time necessary.

Although it was not announced until after "the suit," Tandy made the decision to "open up" *DeskMate* to developers before Apple's legal shenanigans. Initial reaction to this move was very positive, and no wonder, considering the success of the Tandy sales effort.

So here we have an easy-to-use interface that does not engender the legal fears brought onto *Windows* by "the suit." And now Tandy is telling program developers that it will help them make their own products work with *DeskMate*.

This could be very interesting.

— Lonnie Falk

One-Liner Contest Winner . . .

Dice are like paper clips and bobby pins — you can't find them when you need them and you step on them when you don't. If loss of dice has prevented you from playing Monopoly, Aggravation or Trivial Pursuit, you're not totally out of luck!

The listing:

```
3 CLS:L=RND(6):R=RND(6):PRINT@19
4,"*****":PRINT@226,"*"L"*":PRIN
T@258,"*****":PRINT@216,"*****":
PRINT@248,"*"R"*":PRINT@280,"***
**":INPUT"TO ROLL DICE AGAIN PRE
SS ENTER  OR ENTER <M>ENU";A$:IF
A$="M"THEN0ELSE3
```

Jerry Campbell
Idaho Falls, ID

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

One-Liner Contest Winner . . .

Turn CoCo into a New Wave art generator with this one-liner, which uses random numbers to draw and paint circles and shapes on a `PMODE 3` screen.

The listing:

```
0 PMODE3,1:PCLS:SCREEN1,1:F=RND(
4):B=RND(8):COLORF,B:PCLSB:FORL=
0TO5:LINE-(RND(255),RND(191)),PS
ET:CIRCLE(RND(255),RND(191)),RND
(100):NEXT:FORP=0TO10:PAINT(RND(
255),RND(191)),RND(4),F:NEXT:FOR
H=1TO7:FORT=0TO600:NEXTT:GOTO
```

Jim Martin
Silver Bay, MN

(For this winning one-liner contest entry, the author has been sent copies of both *The Second Rainbow Book of Simulations* and its companion *The Second Rainbow Simulations Tape.*)

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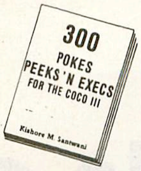

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Create online assistance for any program

Help Is on the Way

By Stephen B. Goldberg

After using OS-9 for a while, you begin to collect a batch of utility programs in your `CMDS` directory from RAINBOW or other third-party suppliers. Some of these programs are used rather infrequently, and it's easy to forget the proper syntax for the commands. Starting with OS-9 Level I Version 2.0, Microware was nice enough to provide a `Help` command that can jog a fading memory with the correct way of entering a command. Unfortunately, help is available only for those utilities that are on the disk when you get it from Radio Shack.

Helpmate is a BASIC09 program that provides the means to add the syntax and description of any new program for online assistance by the `Help` command. The program descriptions are located in the `/D0/SYS/cmds.hp` file, and each one is 100 bytes in length. The name of the module starts at the first byte, the parameter and option list is located at the 13th byte and the description of the program's function starts at the 36th byte. The maximum space available is 10 characters for the name, 22 characters for the parameters and

---

Steve Goldberg is a dentist who relaxes by writing OS-9 utilities on his son's CoCo.

The listing: `Helpmate`

```
PROCEDURE helpmate
 0000       TYPE all=name:STRING[12]; pram:STRING[23]; descr:STRING[65]
 0026       DIM entry:all
 002F       DIM char,bell:STRING[1]
 003F       DIM max:STRING[19]
 004B       DIM path,cls:BYTE
 0056       DIM pointer:REAL
 005D       DIM x,y,z:INTEGER
 006C       bell=CHR$(7)
 0074       cls=12 \(* CLEAR SCREEN *)
 008D       max=" CHARACTERS MAXIMUM"
 00A7       REPEAT
 00A9         REPEAT
 00AB           pointer=0
 00B3           PUT #1,cls
 00BC           PRINT "H E L P M A T E  .  .  ."
 00D8           PRINT \ PRINT "COPYRIGHT (c) 1987 S.B.Goldberg"
 00FD           PRINT "==========================="
 0120           PRINT
 0122           REPEAT
 0124             INPUT "ENTER MODULE NAME: ",entry.name
 0143             y=LEN(entry.name)
 014F             IF y>10 THEN
 015B               PRINT bell
 0160               PRINT "10"; max
 016A             ENDIF
 016C           UNTIL y>0 AND y<11
```

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AUTOMATIC 5 MIN. DISK SAVE: #207
AUTO DIR BACK-UP:No more FS errors #208
BASE CONVERTER:#209
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FULL ERRORS: English error messages #233
FUNCTION KEYS:Speeds prog time #234
GRADE BOOK:Great for teachers #235
GRAPHICS SCREEN COMPRESSION: #236
GRAPHICS SHIFTER: #237
GRAPHICS TYPE SETTING:2 letter sizes #238
GRAPHICS ZOOM:Magnify/edit graphics #239
INPUT/OUTPUT DATA MONITOR: #240
KEY CLICKER:Ensures input accuracy #241
KEY SAVER:Save/recall keystrokes #242
LAST COMMAND REPEATER: #243
LINE COPY:Copy BASIC lines #244
LINE CROSS-REFERENCE: #245
LIST/DIR PAUSE:No more fly-bys #246
LOWER CASE COMMANDS: #247
MASS DISK INITIALIZATION: #248
MESSAGE ANIMATOR:Great billboard #249
METRIC CONVERSION: #250
ML/BASIC PROGRAM MERGE: #251
ML TO DATA CONVERTER: #252
MULTIPLE CHOICE TEST MAKER: #253
NUMERIC KEYPAD: #254
ON BREAK GOTO COMMAND: #255
ON ERROR GOTO COMMAND: #256
ON RESET GOTO COMMAND: #257
PHONE DIRECTORY: #258
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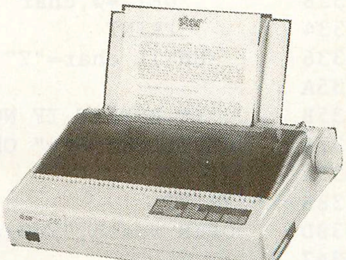

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```
017E
017F      (* MAKE ALL CHARACTERS UPPER CASE *)
01A3      FOR x=0 TO y-1
01B7        z=LAND(PEEK(ADDR(entry.name)+x),223)
01CC        IF z>64 AND z<91 THEN
01DF          POKE ADDR(entry.name)+x,z
01F1        ENDIF
01F3      NEXT x
01FE
01FF      entry.name=entry.name+CHR$(0)
0212      PRINT
0214      LOOP
0216        INPUT "ENTER PARAMETER(S): ",entry.pram
0236      EXITIF LEN(entry.pram)<23 THEN
0246      ENDEXIT
024A        PRINT bell
024F        PRINT "22"; max
0259      ENDLOOP
025D      entry.pram=entry.pram+CHR$(0)
0270      PRINT
0272      REPEAT
0274        PRINT "ENTER DESCRIPTION: ";
028C        READ #0,entry.descr
0299        y=LEN(entry.descr)
02A5        IF y>64 THEN
02B1          PRINT bell
02B6          PRINT "64"; max
02C0        ENDIF
02C2      UNTIL y>0 AND y<65
02D4      entry.descr=entry.descr+CHR$(0)
02E7      PRINT
02E9      PRINT entry.name+" "+entry.pram
02FC      PRINT entry.descr
0304      PRINT
0306      REPEAT
0308        PRINT "Is this entry correct? (y/n): ";
032B        GET #0,char
0334        PRINT
0336      UNTIL char="Y" OR char="y" OR char="N" OR char="n"
035A
035B      (* REPEAT IF NOT CORRECT *)
0376    UNTIL char="y" OR char="Y"
038A
038B    PRINT
038D    OPEN #path,"/d0/sys/cmds.hp":WRITE
03A7
03A8    (* FIND END OF FILE *)
03BE    WHILE EOF(#path)=FALSE DO
03CA      SEEK #path,pointer
03D4      pointer=pointer+SIZE(entry)
03E3    ENDWHILE
03E7
03E8    PUT #path,entry
03F2    CLOSE #path
03F8    REPEAT
03FA      PRINT "Make another entry? (y/n): ";
041A      GET #0,char
0423      PRINT
0425    UNTIL char="Y" OR char="y" OR char="N" OR char="n"
0449
044A    (* REPEAT FOR ANOTHER ENTRY *)
0468  UNTIL char="N" OR char="n"
047C  END
```

options and 64 characters for the description. Each section of the `Help` message is terminated with a null (`CHR$(0)`).

Helpmate is self-explanatory. Execute the `Help` command for a few utilities to see the form of the display; run *Helpmate*, and answer the prompts on the screen to add help information for a new program.

First, enter the module's name. You don't have to use uppercase; the program automatically converts any lowercase characters to uppercase. Next, list the parameters and options expected on the command line. Finally, type in a short description of the program's functions.

After entering the requested information, you will be shown the entry exactly as it will be displayed by `Help`. If the entry is correct, it will be added to the `Cmds.hp` file. If in error, you are given the opportunity to re-enter the data. After saving the new information, you can either enter another or exit the program.

(Questions or comments about this program may be directed to the author at 695 Plainview Road, Bethpage, NY 11714. Please enclose an SASE when requesting a reply.)

One-Liner Contest Winner . . .

CoCo goes LOGO in this short program, using *sin/cos* techniques to draw a variety of designs in `PMODE 4`.

The listing:

```
0 V=2.6:FORQ1=1TO100:P=90:LINE(7
9,15)-(79,15),PSET:PMODE4:PCLS:S
CREEN1,1:FORX=1TO881STEPV:P=P-.5
:K=128-COS(X)*P:L=92-SIN(X)*P:LI
NE-(K,L),PSET:NEXT:V=V+.1:FORG=1
TO2000:NEXTG:NEXTQ1
```

Frank Unger, Jr.
Manchester, MO

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape*.)

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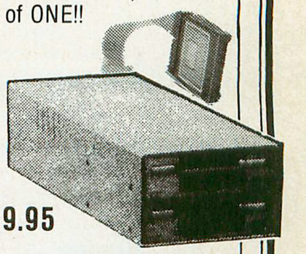

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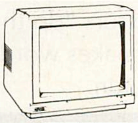

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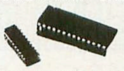

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Disk Basic Rom 1.1 (Needed for CoCo III) **$29.95. 68B09E Chip: $14.95 ECB Rom 1.1: $29.95. Multi-Pak PAL Chip** for CoCo 3 **$19.95 PAL Switcher:** Now you can switch between the CoCo II and CoCo III modes when using the Multi-Pak. You need the OLDER and NEW PAL chip for the 26-3024 Multipak. Only **$39.95** With NEW PAL Chip **$49.95** **5¼" DS/DD Disks: $0.45 each.**

MJ
MICROCOM SOFTWARE
P.O. Box 214
Fairport, N.Y. 14450
Phone (716) 223-1477

All orders $50 and above (except Disk Drives) shipped by UPS 2nd Day Air within Continental US at no extra charge. No CODs. We accept Visa, MC, Amex, Check or MO. Please add $3.00 S&H (USA/Canada). Other countries $5.00 S&H. NYS residents please add sales tax.

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No Free 2nd Day Shipping for Monitors.

To Place Credit Card Orders, Call Toll Free 1-800-654-5244 9 AM – 9 PM EST 7 days a week

NY, Canada, Foreign Orders, Information, Technical Advice and **Order Status** call **1-716-223-1477**

Max-10™

COLORWARE

BLINDING SPEED
Max-10 is entirely written in machine language. Its speed will amaze you.

SLEEK
A lot of word processors "do the job", but Max-10 makes word processing fun.

INTUITIVE
Max-10 is so well designed you can use it without reading the manual.

FUN
Max-10 is actually fun to use, which is quite an achievement for a word processor.

FORMAT
Unlimited choice of right or left alignment, centering, and line spacing. Screen is updated immediately to show exact effects of changes.

PAGE NUMBERING
On-screen page number helps you find your place.

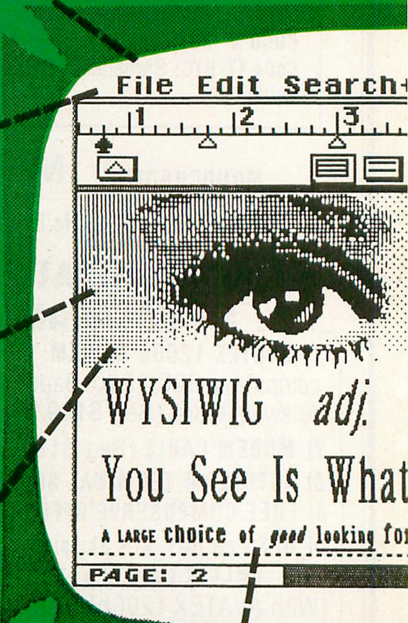
SUPERB FILE SUPPORT
Max-10 menus let you load files without typing anything: simply point and click.

FILE COMPATIBILITY
Max-10 can import files from your outmoded word processor.

GRAPHICS
Mix text and graphics on your page. Pictures can be created by CoCo Max, the DS-69 Digitizer, or any graphics editor.

FIT IT IN
Pictures can be shrunk and stretched in both directions to fit the page and text.

TAB STOPS & MARGINS
The rulers make tabs and margins easy to see, use, and change.



CUT AND PASTE
Move anything (even graphics) anywhere in the document.

Max-10 Specifications: variable line length; right, left, top and bottom margins; word wrap; undo; page numbering; set starting page; left and right justification; centering; margins and centering can be changed anywhere in the document; variable line spacing; programmable headers and footers (with centering, graphics, etc.); type ahead; key repeat; key click; scroll up and down; jump to any point in document; ASCII file ouput for compatibility; disk directory; kill files; bold, italic, underline, superscript and subscript type styles; wordwrap; block cut, copy, move; global search and replace; paragraph indent; clipboard; merge; show file (on disk); free memory display, page count, paragraph count, word count; graphics can be resized and moved; multiple fonts; error recovery and more!

PRINTERS
Max-10 currently works with the following printers: DMP-105, DMP-106, DMP-130, Epson MX,RX,FX,LX and compatible, Gemini 10 series, CGP-220, and OKI-92.

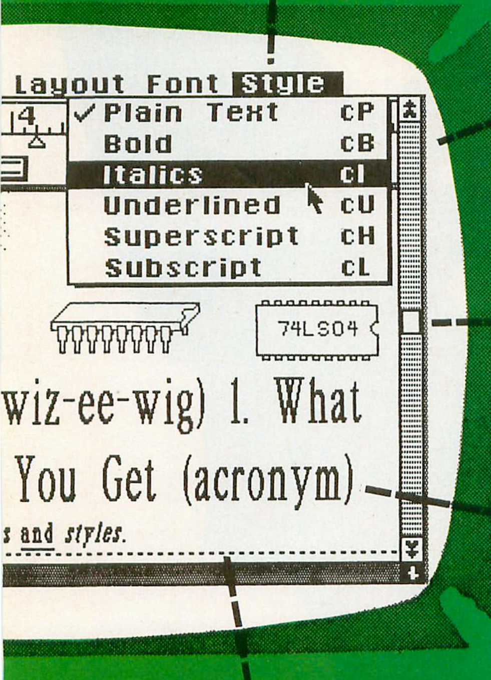
BY DAVE STAMPE
Author of CoCo Max III, the best and most acclaimed CoCo 3 Graphics Editor.

GRAPHICS
Max-10 can import pictures stored in the following formats: CoCo Max I,II,III, MGE, MGF, 5 level DS-69, as well as any standard PMODE 4, HSCREEN 2 or 3 picture.

THE DAZZLING WORD PROCESSOR
AND DOCUMENT CREATOR FOR THE COCO 3

PULL DOWN MENUS
All Max–10 Functions can be easily accessed through the six pull–down menus. There are no commands to learn.

WYSIWYG!
What You See Is What You Get. Max–10 is the only CoCo word processor with graphics where the printout looks exactly like the screen (Macintosh style).



wiz-ee-wig) 1. What

You Get (acronym)

s and *styles.*

UNDO
The undo feature lets you change your mind even AFTER you make a drastic change, such as a "block delete".

SCROLL BOX
Point and click for lightning fast access to any point in the entire document.

MORE FONTS
Max–10 features 20 different fonts (styles and sizes). It goes well beyond your printer's built in character sets.

PAGE BREAK
Dotted lines on the screen show where pages begin and end. No more surprises at printing time.

TOTAL CONTROL
Any number of available character styles and sizes can be mixed on the same line.

FULL JUSTIFICATION
Proportionally spaced characters let you create text that looks really nice. No more squished "M"s and oversized "I"s.

HEADERS & FOOTERS
These are super easy to add and edit. They can even include graphics and pictures!

Why Max–10?
Most of you already have an "adequate" word processor, so why did we spend considerable time and effort to create **Max–10**?

Because you asked for it. **CoCo Max** made graphic creation fun. It is fast and feature loaded, yet amazingly easy to use. You wanted your word processor to be as friendly, forgiving, and amazing as **CoCo Max**. We couldn't do it on the CoCo 1 or 2, but with the advanced CoCo 3 graphics, the word processor you always wanted is here: **Max–10**

Max–10 is not just a word processor. It gives you letter styles and sizes that your printer doesn't have. It lets you mix graphics and pictures in your text for a professional looking output.

Additionally, the screen shows exactly what your output will look like. Text is in the size and style that it will print. Page breaks, line length and spacing are clearly shown. No more hoping that the text will fit, no more guessing at type styles, no more messing with printer codes, no more cryptic commands to memorize, and best of all, the undo feature lets you make a mistake and still recover your text.

Max–10 makes typing easy, and you'll love the new things you can do with the best word processor ever created for the CoCo.

PRICE: $79.95

CoCo Max III OWNERS
If you already own CoCo Max III, deduct $10 from your order.

SYSTEM REQUIREMENTS
Any CoCo 3 (128K or 512K) with at least 1 Disk Drive.
Mouse or joystick.
Monochrome, RGB or Composite monitor.

COLORWARE
A division of Sigma Industries, Inc.

TO ORDER
Call (203) 656-1806 9 to 5 Eastern time
Visa or Mastercard accepted. C.O.D orders $3 extra
Send check or M.O. to: Colorware, 242-W West Ave, Darien CT 06820
Add $3 per order for shipping ($5 to Canada, 10% to overseas).
CT residents add 7.5% sales tax

Mellow music to set the mood

Playin' the Blues

By Val Burke

There are blues for when you're happy, blues for when you're sad, blues for when you're good, blues for when you're bad — blues are written for just about every event in life. I decided to write *CoCo Blues* for all those CoCo enthusiasts who have spent many long hours typing in and debugging programs and who need a little soothing blues music to help them relax after one of "those" days with the computer.

The program plays a laid-back, 12-bar blues with some mellow graphics pizazz added for good measure. As simple as the music may sound, it's quite unique.

When you `LIST` the program you will notice that I used `T3` as the tempo at which *CoCo Blues* is played. In reality the tempo is somewhere between `T2` and `T3`. `T2` would have made the music sound like a funeral march, while `T3` would have made it lose its "funky, down-home" feeling.

It took me long, hard hours to figure out a scenario that would make *CoCo Blues* rhythmically correct. I had to use `P` commands all through the program to slow it down, and one of the lines even contains `L128` commands.

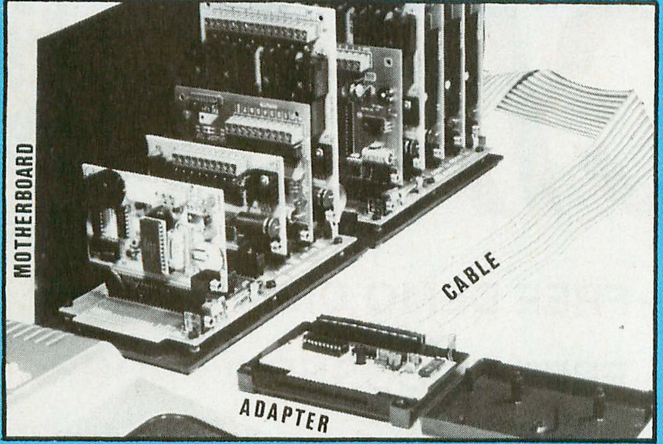
After a hectic day on the CoCo keyboard, there's no need to turn on your stereo to hear some soothing music. Just turn your monitor volume down low, sit back, relax and enjoy *CoCo Blues*.

(Questions or comments regarding this program may be directed to the author at P.O. Box 86, Red Oak, GA 30272. Please enclose an SASE when requesting a reply.) ☐

Val Burke, a professional musician who owns a CoCo 2 and lives in Red Oak, Georgia, enjoys writing computer programs in his spare time.

The Amazing A-BUS

NEW



An A-BUS system with two Motherboards
A-BUS adapter in foreground

The A-BUS system works with the original CoCo, the CoCo 2 and the CoCo 3.

Plug into the future

With the A-BUS you can plug your PC (IBM, Apple, TRS-80) into a future of exciting new applications in the fields of control, monitoring, automation, sensing, robotics, etc.

Alpha's modular A-BUS offers a proven method to build your "custom" system today. Tomorrow, when you are ready to take another step, you will be able to add more functions. This is ideal for first time experimenting and teaching.

A-BUS control can be entirely done in simple BASIC or Pascal, and no knowledge of electronics is required!

An A-BUS system consists of the A-BUS adapter plugged into your computer and a cable to connect the Adapter to 1 or 2 A-BUS cards. The same cable will also fit an A-BUS Motherboard for expansion up to 25 cards in any combination.

The A-BUS is backed by Alpha's continuing support (our 11th year, 50000 customers in over 60 countries).

The complete set of A-BUS User's Manuals is available for $10.

About the A-BUS system:

- All the A-BUS cards are very easy to use with any language that can read or write to a Port or Memory. In BASIC, use INP and OUT (or PEEK and POKE with Apples and Tandy Color Computers)
- They are all compatible with each other. You can mix and match up to 25 cards to fit your application. Card addresses are easily set with jumpers.
- A-BUS cards are shipped with power supplies (except PD-123) and detailed manuals (including schematics and programming examples).

Relay Card RE-140: $129

Includes eight industrial relays, (3 amp contacts, SPST) individually controlled and latched. 8 LED's show status. Easy to use (OUT or POKE in BASIC). Card address is jumper selectable.

Reed Relay Card RE-156: $99

Same features as above, but uses 8 Reed Relays to switch low level signals (20mA max). Use as a channel selector, solid state relay driver, etc.

Analog Input Card AD-142: $129

Eight analog inputs. 0 to +5V range can be expanded to 100V by adding a resistor. 8 bit resolution (20mV). Conversion time 120us. Perfect to measure voltage, temperature, light levels, pressure, etc. Very easy to use.

12 Bit A/D Converter AN-146: $139

This analog to digital converter is accurate to .025%. Input range is −4V to +4V. Resolution: 1 millivolt. The on board amplifier boosts signals up to 50 times to read microvolts. Conversion time is 130ms. Ideal for thermocouple, strain gauge, etc. 1 channel. (Expand to 8 channels using the RE-156 card).

Digital Input Card IN-141: $59

The eight inputs are optically isolated, so it's safe and easy to connect any "on/off" devices, such as switches, thermostats, alarm loops, etc. to your computer. To read the eight inputs, simply use BASIC INP (or PEEK).

24 Line TTL I/O DG-148: $65

Connect 24 input or output signals (switches or any TTL device) to your computer. The card can be set for: input, latched output, strobed output, strobed input, and/or bidirectional strobed I/O. Uses the 8255A chip.

Clock with Alarm CL-144: $89

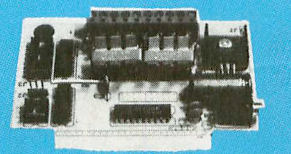
Powerful clock/calendar with: battery backup for Time, Date and Alarm setting (time and date); built in alarm relay, led and buzzer; timing to 1/100 second. Easy to use decimal format. Lithium battery included.

Touch Tone® Decoder PH-145: $79

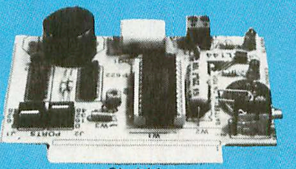
Each tone is converted into a number which is stored on the board. Simply read the number with INP or POKE. Use for remote control projects, etc.

A-BUS Prototyping Card PR-152: $15

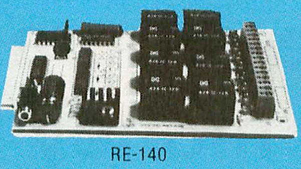
3½ by 4½ in. with power and ground bus. Fits up to 10 I.C.s



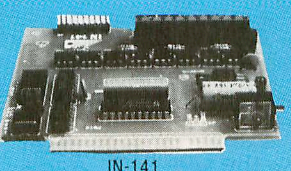
ST-143



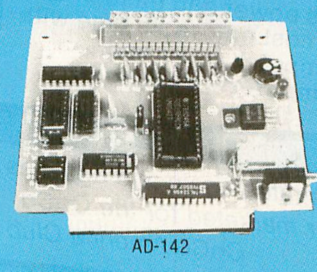
CL-144



RE-140



IN-141



AD-142

Smart Stepper Controller SC-149: $299

World's finest stepper controller. On board microprocessor controls 4 motors simultaneously. Incredibly, it accepts plain English commands like "Move arm 10.2 inches left". Many complex sequences can be defined as "macros" and stored in the on board memory. For each axis, you can control: coordinate (relative or absolute), ramping, speed, step type (half, full, wave), scale factor, units, holding power, etc. Many inputs: 8 limit & "wait until" switches, panic button, etc. On the fly reporting of position, speed, etc. On board drivers (350mA) for small steppers (MO-103). Send for SC-149 flyer.

Remote Control Keypad Option RC-121: $49
To control the 4 motors directly, and "teach" sequences of motions.

Power Driver Board Option PD-123: $89
Boost controller drive to 5 amps per phase. For two motors (eight drivers).

Breakout Board Option BB-122: $19
For easy connection of 2 motors. 3 ft. cable ends with screw terminal board.

Stepper Motor Driver ST-143: $79

Stepper motors are the ultimate in motion control. The special package (below) includes everything you need to get familiar with them. Each card drives two stepper motors (12V, bidirectional, 4 phase, 350mA per phase).
Special Package: 2 motors (MO-103) + ST-143: **PA-181: $99**

Stepper Motors MO-103: $15 or 4 for $39

Pancake type, 2¼" dia, ¼" shaft, 7.5°/step, 4 phase bidirectional, 300 step/sec, 12V, 36 ohm, bipolar, 5 oz-in torque, same as Airpax K82701-P2.

Current Developments

Intelligent Voice Synthesizer, 14 Bit Analog to Digital converter, 4 Channel Digital to Analog converter, Counter Timer, Voice Recognition.

A-BUS Adapters for:

IBM PC, XT, AT and compatibles. Uses one short slot.	AR-133...$69
Tandy 1000, 1000 EX & SX, 1200, 3000. Uses one short slot.	AR-133...$69
Apple II, II+, IIe. Uses any slot.	AR-134...$49
TRS-80 Model 102, 200 Plugs into 40 pin "system bus".	AR-136...$69
Model 100. Uses 40 pin socket. (Socket is duplicated on adapter).	AR-135...$69
TRS-80 Mod 3,4,4D. Fits 50 pin bus. (With hard disk, use Y-cable).	AR-132...$49
TRS-80 Model 4P. Includes extra cable. (50 pin bus is recessed).	AR-137...$62
TRS-80 Model I. Plugs into 40 pin I/O bus on KB or E/I.	AR-131...$39
Color Computers (Tandy). Fits ROM slot. Multipak, or Y-cable.	AR-138...$49

A-BUS Cable (3 ft, 50 cond.) CA-163: $24

Connects the A-BUS adapter to one A-BUS card or to first Motherboard.
Special cable for two A-BUS cards: CA-162: $34

A-BUS Motherboard MB-120: $99

Each Motherboard holds five A-BUS cards. A sixth connector allows a second Motherboard to be added to the first (with connecting cable CA-161: $12). Up to five Motherboards can be joined this way to a single A-BUS adapter. Sturdy aluminum frame and card guides included.

- The A-BUS is not a replacement for the Multi-pak

Add $3.00 per order for shipping.
Visa, MC, checks, M.O. welcome.
CT & NY residents add sales tax.
C.O.D. add $3.00 extra.
Canada: shipping is $5
Overseas add 10%

a Sigma Industries Company

ALPHA Products
242-W West Avenue, Darien, CT 06820

Technical info: (203) 656-1806
Orders only (Except in CT) **800 221-0916**
Connecticut orders: (203) 348-9436
All lines open weekdays 9 to 5 Eastern time

SPECIAL

WITH YOUR
COCO MAX III ORDER:

- FREE DEMO DISK
- FREE COCOSHOW PROGRAM
- FREE EXTRA FONTS DISK

CoCo Max™ III

must be the most enjoyable, useful, and awesome program you've ever seen or your money back. Instantly, no questions asked.

CALL NOW TOLL FREE 1-800 221 Mon-Fri 9 to 5 EST **AND LET THE FUN BEGIN**

A FEW QUOTES :

An outstanding program that almost turns your CoCo into a replica of the Macintosh. Terrific hi-res color, very easy to learn and use.
- Family Computing

There is absolutely nothing else on the Color Computer that is comparable to CoCo Max's power and ease of use. The most enjoyable time with a computer I ever had.
- Computerware Review

I never expected to see anything like it on my CoCo screen. There isn't a single command to remember. Even a person who has no drawing ability like myself can create a presentable picture. I've spent hours just doodling enjoying all the things from silly to the serious. Fascinating experience. Buy it, you won't be sorry.
- 6809 Express

In Everyone's book, CoCo Max is rated again and again as the most incredible product ever marketed for the CoCo.
–CoCo America Club

Note: There is only one *CoCo Max III*. Do not confuse COLORWARE's *CoCo Max* with similar sounding imitations.

INTRODUCING THE NEXT GENERATION: CoCo Max™ III*

More Resolution More Power More Color Built-in Animation More Speed More Type Styles More Tools Amazing Color Sequencing

"The best program ever written for the Color Computer"

That's how thousands of enthusiastic users rated the **CoCo Max II** drawing program. With **CoCo Max III** we are ready to amaze them again. Instead of "patching" CoCo Max II, we rewrote it from scratch to take advantage of the CoCo Max III hardware. The results will knock your socks off! Below is a brief list of some of the *new* features, but some, such as **animation**, **color sequencing**, or the **slide show**, have to be seen. Send for the Demo Disk, and see for yourself.

Everybody's favorite drawing package features:
- A 50% larger editing window. - Zoom area **400%** larger. - New drawing tools: **rays**, **3D cubes**, **arcs**,... - New editing tools: shadow, text size,... - Rotate by 1.5° steps - Select any 16 of the 64 possible colors (all 64 colors displayed at once!) - Powerful **color mix**: additive, subtractive, overlay,... - Full **color editing** of patterns and color changing patterns. - Incredible **special effects** with **color cycling** up to 8 colors with variable speed. -**Animation** adds the dimension of motion to your image. (Must be seen.) - Sophisticated data compression saves up to 70% of disk space when saving pictures.
In addition, there are dozens of enhancements to the multitude of features that made CoCo Max II a best seller.

More about CoCo Max III

- CoCo Max III is not an upgrade of CoCo Max II. It is entirely rewritten to take advantage of the new CoCo 3 hardware (More memory, resolution, colors, speed,...)
- The new CoCo Max III **Hi-Res Interface** and the CoCo Max II **Hi-Res Pack** are *not* interchangable.
- The new interface plugs into the joystick connector.
- The CoCo Max III disk is not copy protected.
- CoCo Max III only works with the CoCo 3.
- A Y-Cable or Multi-pak is not necessary.
- Colors are printed in five shades of gray.
- CoCo Max III can read CoCo Max II pictures.

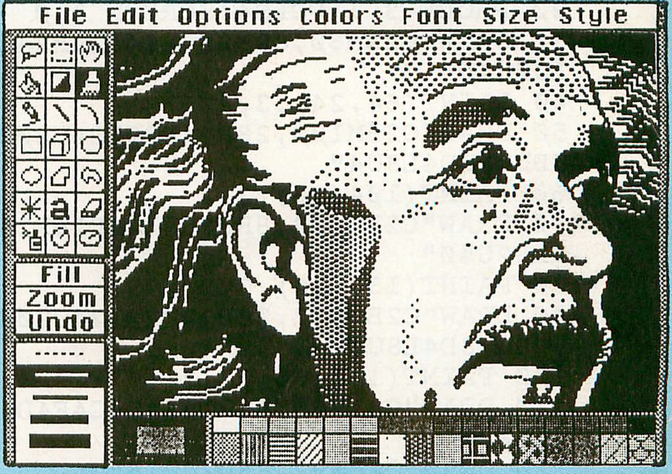
Note: CoCo Max II (for the CoCo 2) is still available on disk ($79.95). CoCo Max I is still available on tape ($69.95). For details, refer to our double page ad in any *Rainbow* from January '86 to July '87

Toll Free operators are for orders only. If you need precise answers, call the **tech line**. (Detailled CoCo Max specs are included with the Demo Disk.)

Add $3.00 per order for shipping.
Visa, MC, checks, M.O. welcome.
CT residents add sales tax.
C.O.D. add $3.00 extra.
Canada: shipping is $5
Overseas add 10%

Technical info: **(203) 656-1806**
Orders only Except in CT **800 221-0916**
Connecticut orders: **(203) 348-9436**
All lines open weekdays 9 to 5 Eastern time

* Beware of inferior imitations that *DO NOT* include a Hi-Res Interface or charge extra for each utility.



Imagine this picture in sixteen colors!

Guaranteed Satisfaction
Use CoCo Max for a full month.
If you are not delighted with it,
we will refund every penny.

System Requirements:
Any CoCo 3 disk system with a Joystick or a Mouse.
We apologize to tape users, CoCo Max III needs the flexibility of a disk.

The **CoCo Max III** system includes: • The special Hi-Res interface (for your mouse or joystick) • The CoCo Max III disk • Many utilities: (To convert Max II pictures, Max colors, etc.) • A detailled User's Manual. Complete system; nothing else to buy. **CoCo Max III: $79.95***

WITH COUPON ONLY

FREE DEMO DISK

Name
Street
City
State Zip
Printer used:

Please include $2 to help defray Processing and Shipping costs. (Check, Money Order, etc. Sorry, no COD or Credit Cards). Coupon (or copy) must be mailled to:

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A division of Sigma Industries, Inc.

COLORWARE
242-W West Avenue
Darien, CT 06820

```
190 ......120
300 ......184
560 ......163
END .....236
```

The listing: COCOBLUZ

```
1 '###########################
2 '#       COCO BLUES        #
3 '#           BY            #
4 '#       VAL BURKE         #
5 '###########################
10 FOR S=1 TO 20 STEP 5
20 PMODE 3,1:PCLS4:SCREEN 1,0
30 DRAW"C2BM60,8R32D8L24D24R24D8
L32U40"
40 PAINT(64,24),3,2
50 DRAW"C2BM100,28R24D20L24U20BR
8BD8R8D4L8U4"
60 PAINT(104,36),3,2
70 DRAW"C2BM132,8R32D8L24D24R24D
8L32U40"
80 PAINT(136,28),3,2
90 DRAW"C2BM172,28R24D20L24U20BR
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100 PAINT(176,36),3,2
110 DRAW"C2BM68,56R12F4D4G4F4D4G
4L12U24"
120 DRAW"C2BM92,88D24R16"
130 DRAW"C2BM120,56D20F4R8E4U20"
140 DRAW"C2BM150,88R16BL16D12R10
BL10D12R16"
150 DRAW"C2BM188,56L12G4D4F4R12F
4D2G4L12"
160 FOR P=1TO 400:NEXT P
170 PLAY"O4T60L8BL8CL8EL8GL8BL8D
":NEXT S
180 DRAW"C2BM28,144D8E4H4BF4R132
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3D6R84E4U1E4U1E4U1E4D36H4U1H4U1H
4U1H2L2U1"
190 PAINT(128,96),3,2
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230 PAINT(112,38),3,2
240 PAINT(184,38),3,2
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O3L64B-L64BO4L8L4CP8O3L16AP8L2.8
P8P4O1L16BP32O2L16CP8O1L16CP32L4
CP32L4GP32L8L4G-P16O3L8.AO4L16CP
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L8.AO4L16CP32L16DP8O3L64B-L64BO4
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260 B$="O1T3P8L16BP32O2L16CP8O1L
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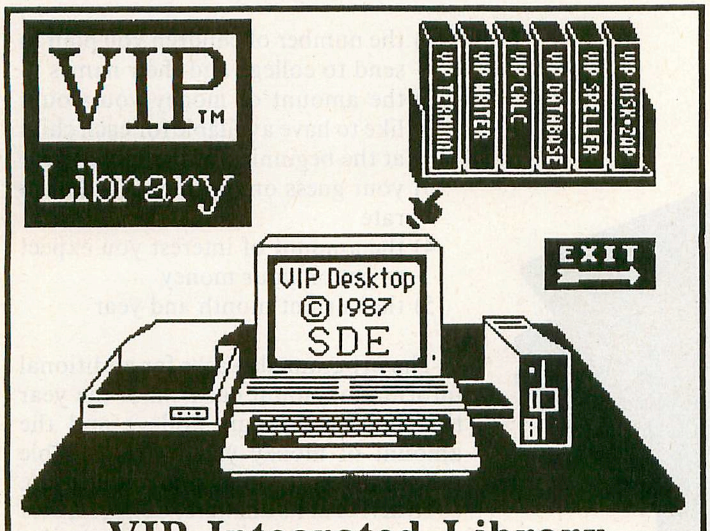
L4B"
270 C$="XA$;XB$;XA$;XB$;"
280 PLAY C$
290 PLAY"O4T3L8CP16L8DP16L8D+P16
L8EP16L8FP16L8F+P32L8GP16L16EP32
L8FP16L16GL64DL64D+L8EL16CP16O3L
8GP16L8FP16L8EP16L8O4CO3P16L2.B-
P2P4P8P16O5L64CO4L64BL64AL64GL64
FL64EL64DL64CO3L64BL64AL64GL64FL
64EL64DL64C"
300 PLAY"O4T3L64CL64C+L16DP8L64O
3B-L64BO4L16CO3P8L16FP16L8AP16O4
L16CP8L128CL128DL16E-L128GL128C+
L16DL128O3B-L128BO4L16CO3P4P4L8A
P16L1G"
310 PLAY"O3T3P1P4P8L16GL16BO4L16
CL16C+L16DL16D+L16EL16FL16F+L16G
L16EL16FL16GL128DL128E-L12EL16CO
3L16GL16G+L16AO4L16FO3L16AL16A-L
16GO4L16E-O3L16GL16G-L16FO4L16DO
3L16FL16EL16E-O4L16CO3L16AP16L1.
GP2P4P16"
320 POKE 65495,0
330 FOR B=1 TO 20 STEP 5
340 PLAY"O3T70L8CL8EL8GL8B-L8O4E
-"
350 PCLS
360 PMODE 3,1:PCLS7:SCREEN1,1
370 COLOR 5,7
380 LINE(16,16)-(32,80),PSET
390 LINE-(48,52),PSET
400 LINE-(64,80),PSET
410 LINE-(80,16),PSET
420 LINE-(64,16),PSET
430 LINE-(56,36),PSET
440 LINE-(48,32),PSET
450 LINE-(40,36),PSET
460 LINE-(32,16),PSET
470 LINE-(16,16),PSET
480 PAINT(48,40),8,5
490 LINE(88,16)-(136,80),PSET,B
500 LINE(104,32)-(120,64),PSET,B
510 PAINT(98,48),8,5
520 LINE(144,16)-(160,80),PSET
530 LINE-(176,52),PSET
540 LINE-(192,80),PSET
550 LINE-(208,16),PSET
560 LINE-(192,16),PSET
570 LINE-(184,36),PSET
580 LINE-(176,32),PSET
590 LINE-(168,36),PSET
600 LINE-(160,16),PSET
610 LINE-(144,16),PSET
620 PAINT(176,42),8,5
630 DRAW"C5BM216,16D48F4E4U48L8B
```

```
D56R8D8L8U8"
640 PAINT(220,40),5,5
650 PAINT(220,76),5,5
660 DRAW"C5BM232,16D48F4E4U48L8B
D56R8D8L8U8"
670 PAINT(236,40),5,5
680 PAINT(236,76),5,5
690 DRAW"C5BM16,112D64R48U16L32U
32R32U16L48"
700 PAINT(24,144),6,5
710 LINE(72,144)-(120,176),PSET,
B
720 LINE(88,160)-(104,164),PSET,
B
730 PAINT(80,160),6,5
740 DRAW"C5BM136,112D64R48U16L32
U32R32U16L48"
750 PAINT(144,140),6,5
760 LINE(192,144)-(240,176),PSET
,B
770 LINE(208,160)-(224,164),PSET
,B
780 PAINT(200,160),6,5
790 FOR P= 1TO 700:NEXT P
800 NEXT B
810 POKE 65494,0
820 GOTO 250
```



VIP Integrated Library

The VIP Integrated Library combines all six popular VIP application programs - VIP Writer*, Speller, Calc, Database, Terminal and Disk-Zap - into one program on one disk. The program is called VIP Desktop. From the desktop you have instant access to word processing with a spelling checker always in attendance, data management with mail-merge, spreadsheet financial analysis, telecommunications and disk maintenance. Just move the hand to the volume on the bookshelf and the application is there. 64K req'd. UNPROTECTED DISK $149.95

* CoCo 3 owners: Purchase the VIP Integrated Library /WE (Writer Enhanced) which has VIP Writer III in place of VIP Writer. UNPROTECTED DISK $159.95

SD Enterprises

(503) 663-2865 P. O. Box 1233. Gresham, Or. 97030
Please add $4 for shipping VIP Library. COD orders add an additional $2.25.
Personal checks allow 3 weeks for delivery. All other orders shipped the same day.

NEW for the CoCo 3!

VIP Database III

DATABASE • MAILMERGE • PRINT SPOOLER

Coming June 15th!

The VIP Database III features selectable screen displays of 40, 64 or 80 characters by 24 lines with choice of 64 foreground and background colors for maximum utility. It uses the CoCo 3's hardware display and double clock speed to be the FASTEST database available. VIP Database III will handle as many records as will fit on your disks and is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses etc., in ascending or descending alphabetic or numerical order. Records can be searched for specific entries, using multiple search criteria. With Database III mail-merge you may also combine files, sort and print mailing lists, print form letters, address envelopes - the list is endless. The built-in MATH package even performs arithmetic operations and updates other fields. VIP Database III also has a print spooler and report generator with unlimited print format capabilities including embedable control codes for use with all printers UNPROTECTED DISK $69.95

VIP Database owners: Upgrade to the VIP Database III for $39.95. Send original disk. Include $3 shipping.

Run VIP on your CoCo 1, 2 or 3!

VIP Database

"ONE OF THE BEST" JULY 1984 "RAINBOW"

VIP Database has all the features of VIP Database III except the screen widths are 51, 64 & 85. Screen colors are black, green and white, double speed is not supported, Spooler is unavailable. Even so, VIP Database is the fastest database for the CoCo 1 & 2! UNPROTECTED DISK $49.95

VIP Calc

"MORE USEABLE FEATURES"-Feb 1985 "Rainbow"

Now every CoCo owner has access to a calculating and planning tool better than VisiCalc™, containing all its features and commands and then some. VIP Calc displays 32, 51, 64 or 85 characters by 21 or 24 lines right on the screen. VIP Calc allows up to a 33K worksheet with up to 512 columns by 1024 rows! In addition, VIP calc has multiple windows which allow you to compare and contrast results of changes. Other features include 16 DIGIT PRECISION • trig. functions • averaging • algebraic functions • column and row ascending or descending SORTS • locate formulas or titles in cells • block move and replicate • global or local column width • limitless programmable functions • works with any printer, Embed printer control codes for customized printing. Combine spreadsheet tables with VIP Writer documents to create ledgers, projections, statistical and financial budgets and reports. Requires 64K. UNPROTECTED DISK $59.95

VIP Terminal

RATED BEST IN JANUARY 1984 "RAINBOW"

For your important communications needs you've got to go beyond software that only lets you chat. You need a smart terminal so that you can send and receive programs and messages and print them! The VIP Terminal features 32, 51, 64 or 85 characters by 21 or 24 lines on the screen and has a 43K byte buffer to store information. UNPROTECTED DISK $39.95

VIP Disk-ZAP

RAVED ABOUT IN THE APRIL 1983 "RAINBOW"

VIP Disk-Zap is the ultimate repair utility for simple and quick repair of most disk errors. Designed with the non-programmer in mind, the VIP Disk-Zap will let you retrieve all types of bashed files, BASIC and ML programs. The 50 page tutorial makes the novice an expert. UNPROTECTED DISK $24.95

See our other ads for more VIP Products!

Please add $3.00 for shipping. COD orders add an additional $2.25. Personal checks allow 3 weels for delivery. All other orders shipped the same day.

Calculate easy monthly payments to meet your financial needs

Beating the College Crunch

By Larry P. Pittman

College Costs is designed to tell you the amount of money you need to invest monthly to meet your goal for college costs for your children. As my older children approach college, this has become more of a priority for me.

The program first asks you to enter the following information before calculations are performed:

1) the number of children you plan to send to college and their names
2) the amount of money you would like to have available for each child at the beginning of the school year
3) your guess on the annual inflation rate
4) the amount of interest you expect to get on your money
5) the current month and year

The program also asks for additional information about each child: the year that child will begin college and the amount of money you have available now to invest for that child's education.

To arrive at its answers, *College Costs* uses a few standard economics formulas dealing with present and future values of money. For instance, if you have a certain amount of money to invest (P) and a certain interest rate (i) for a given length of time (n), then the amount of money you will have at the end of that time (F) can be calculated by the following formula:

$$F = P\ (1 + i)^n$$

This formula is used in the program to determine the effects of inflation on

VIP Writer III Summer SPECIAL!

> *"...High powered software for the CoCo 3...Fast, easy to use...a true bargain for the serious CoCo user."* — **Ted Paul**

VIP Writer III vs The Competition

VIP Writer has ALWAYS led the pack with features and now VIP Writer III still leads the way! The chart below illustrates this fact. Telewriter 128 only gives you 48K for text. Why is it called Telewriter 128? Word power 3 gives only 72K! Where's the rest? VIP Writer III makes use of over 106K! VIP Writer III is the ONLY CoCo 3 WORD PROCESSOR WORTHY of it's name!

WORD PROCESSOR COMPARISON CHART

CoCo3 with 128K	VIP Writer III	Telewriter 128	Word Power 3
Text Storage	OVER 49,000	48,000	72,000
Print Spooler	YES 57,000	NONE	NONE
Total Storage	**106,000**	48,000	72,000
Spelling Checker	VIP Speller	NONE	FREE WARE
RGB HD Support	100%	NONE	NONE
Screen Display	32/40/64/80	40/80	80

SCREEN DISPLAY OPTIONS

As the chart above shows - VIP Writer III offers more screen width options - all with 24 lines and actual lower case letters using the CoCo 3's hardware display! You can choose fore and background colors from up to 64 different hues. Color can be turned ON or OFF for the best possible display using a color or monochrome monitor or TV set. VIP Writer III has a built in on-line context sensitive help facility which displays command usage in easy to read colored windows. VIP Writer III also runs at double clock speed and is **FAST!**

TEXT FILE STORAGE

VIP Writer III creates ASCII text files which are compatible with all other VIP Programs as well as other programs which use ASCII file format. You can use VIP Writer III to even create BASIC programs! There is a 49K text buffer and disk or cassette file linking allowing virtually unlimited text space. VIP Writer III works with up to four disk drives and lets you display disk directories and free space as well as rename or kill disk files. In addition VIP Writer III is 100% compatible with the RGB Computer Systems HARD DISK.

EDITING FEATURES

VIP Writer III has a full featured screen editor which can be used to edit text with lines up to 240 characters long with or without automatic word wrap around. You can select type-over mode or insert mode. There is even an OOPS command to recall a cleared text buffer. Other editing features include: Type-ahead, typamatic key repeat and key beep for flawless text entry, end of line bell, full four way cursor control with scrolling, top of textfile, bottom of textfile, page up, page down, top of screen, bottom of screen, beginning of line, end of line, left one word, right one word, DELETE character, to beginning or end of line, word to the left or right, or entire line, INSERT character or line, LOCATE and/or CHANGE or DELETE single or multiple occurrence using wildcards, BLOCK copy, move or delete with up to TEN simultaneous block manipulations, TAB key and programmable tab stops, word count, line restore, three PROGRAMMABLE FUNCTIONS to perform tasks such as auto column creation and disk file linking for continuous printing.

TEXT FORMATTING

VIP Writer III automatically formats your text for you or allows you to format your text in any way you wish. You can change the top, bottom, left or right margin and page length. You can set your text flush left, center or flush right. You can turn right hand justification on or off. You can have headers, footers, page numbers and TWO auxiliary lines which can appear on odd, even or all pages. You can also select the line on which they appear! You can even change the line spacing! Parameters can be altered ANYWHERE within text.

PREVIEW PRINT WINDOW

The VIP Writer III features a paper saving format window which allows you to preview your document BEFORE PRINTING IT! You are able to see centered text, margins, page breaks, orphan lines etc. This makes hyphenation a snap!

PRINTING

VIP Writer III prints TWICE as fast as any other CoCo word processor! VIP Writer III supports most any printer serial or parallel using the parallel interface described in Nov-Dec. '87 RAINBOW magazine, or ANY external serial to parallel interface, and gives you the ability to select baud rates from 110 to 19,200. You are able to imbed printer control codes anywhere in your text file EVEN WITHIN JUSTIFIED TEXT! VIP Writer III also has twenty PROGRAMMABLE PRINTER SEQUENCES which allow you to easily control all of your printers capabilities such as underline, bold, italics, superscript and subscript using simple keystrokes. Additional printer features include: single sheet pause, print pause, word length and line feed selection.

PRINT SPOOLING

VIP Writer III incorporates a built in print spooler with a 57,000 character buffer which allows you to print one document WHILE you are editing another. You don't have to wait until your printer is done before starting another job!

DOCUMENTATION

VIP Writer III is supplied with a 125 page instruction manual which is well written and includes many examples. The manual has a tutorial and glossary of terms for the beginner as well as a complete index! VIP Writer III includes VIP Speller at **NO ADDITIONAL COST.** **UNPROTECTED DISK $79.95**
Cassette version does not include VIP Speller. **TAPE $59.95**

VIP Writer owners: Upgrade to the VIP Writer III Disk for $49.95 or Tape for $39.95. Send original disk or tape. Include $3 shipping.

VIP Writer THE ORIGINAL

VIP Writer is also available for CoCo 1 and 2 owners and has all the features found in the VIP Writer III including VIP Speller except for the following: The screen display is 32, 51, 64 or 85 columns by 21 or 24 rows. Screen colors are green, black or white. Help is not presented in colored windows. Double clock speed is not supported. Parallel printer interface is not supported. Print spooler is not available. Hard disk is not supported. Even so, VIP Writer still out-features the rest! It's a CoCo 1 or 2 owners best choice in word processors. Includes VIP Speller. **UNPROTECTED DISK $69.95**
Cassette version does not include VIP Speller. **TAPE $49.95**

VIP Speller SPELL CHECKER

VIP Speller works with ANY ASCII file created by most popular word processors. It automatically checks text files for words to be corrected, marked for special attention or even added to the dictionary. You can even view the misspelled word in context! VIP Speller comes with a specially edited 50,000 word dictionary, and words can be added to or deleted from the dictionary or you can create your own. **UNPROTECTED DISK $34.95**

It's Word Processor Trade In Time

For a limited time you can trade in your old software for the VIP Writer I or III and get the VIP Speller FREE! Send in your old disk or tape and manual. VIP Writer tape $34.95, disk $49.95. VIP Writer III tape $44.95, disk $59.95. Include $3 S/H. Tapes do not include VIP Speller. Expires 8/31/88

See our other ads for more VIP Products!

SD ENTERPRISES

☎(503) 663-2865 ✉POB 1233 Gresham, OR 97030

Please add $3 for shipping and handling. COD orders add an additional $2.25. Checks allow 3 weeks for delivery. All other orders are shipped the same day.

Telewriter 128 is a trademark of Cognitec. Word Power 3 is a trademark of Microcom Software.

your money. In other words, the amount of money you believe you need now must be adjusted for inflation so that you will have the proper amount when college time finally arrives. Here is the other main formula the program uses:

$$A = F (i / ((1 + i)^n - 1))$$

This formula calculates the unknown A, which represents the monthly (or other periodic) amount that is required if a future needed amount (F) at a given interest rate (i) is known.

The program always assumes that the payout of money will be required in September of each school year. Although money is usually expended throughout the school year, I felt this was a conservative approach. It also assumes that each child will attend a four-year college. You may adjust it to allow for different lengths of time by changing Line 710. For a five-year program, change Line 710 to the following:

```
FORX=1TO4
```

In other words, this `FOR-NEXT` loop should be repeated one less time than the total years of college to be attended.

After the initial calculation, the program offers you the opportunity to revise either the inflation rate, the interest rate, or the amount of money required each year. This can be used to see what happens to your monthly payment as these variables are changed. It is certainly possible that your children may go to schools that cost vastly different amounts. If so, then it would be wise to enter each child separately.

College Costs is designed to work with a CoCo 1, 2 or 3. Line 180 checks to see if your computer is a CoCo 3. If it is, then the graphics are adjusted throughout the program. I did this because I much prefer having the 40-column screen for text. By using this check, the program still runs fine on a CoCo 1 or 2, but will give you improved text when or if you decide to purchase a CoCo 3. If you use a CoCo 3 but prefer that this program run in the 32-column mode, simply delete lines 160 through 210.

(Questions or comments regarding this program may be directed to the author at 11406 Majorca Place, Fenton, MI 48430. Please enclose an SASE when requesting a reply.) ☐

240	21	930	165
350	30	1050	30
460	149	1180	50
590	1	END	229
770	2		

The listing: `COLLEGE`

```
100 '         SAVING FOR COLLEGE
110 '
120 '         COPYRIGHT (C) 1987
130 '
140 '         LARRY P PITTMAN
150 '         11406 MAJORCA PL.
160 '         FENTON, MI 48430
170 '
180 IFPEEK(&HF636)=15THENCO=3:WI
DTH40:PALETTE0,0:PALETTE8,63:CLS
1:ELSEGOTO220:'CHECK IF COCO 3
190 PRINT"**************COLLEGE
COSTS*************":PRINT:PRINT:
PRINT"THIS PROGRAM WILL CALCULAT
E YOUR MONTHLYCOSTS THAT YOU NEE
D TO SAVE FOR YOUR    CHILDREN F
OR COLLEGE.  YOU FIRST NEED TO";
200 PRINT"ENTER SOME GENERAL INF
ORMATION AND THEN SOME SPECIFIC
INFORMATION ABOUT EACH    CHILD.
":PRINT:PRINT:PRINT"    ";
210 GOTO250
220 CLS:PRINT"**********COLLEGE
COSTS*********":PRINT:PRINT"THIS
 PROGRAM WILL CALCULATE YOURMONT
HLY COSTS THAT YOU NEED TO  SAVE
 FOR YOUR CHILDREN FOR      COLL
EGE.  YOU FIRST NEED TO"
230 PRINT"ENTER SOME GENERAL INF
ORMATION  AND THEN SOME SPECIFIC
          INFORMATION ABOUT EACH
 CHILD."
240 PRINT:PRINT
250 PRINT"    PRESS ANY KEY TO B
EGIN"
260 FORX=1TO200:NEXT:SOUND150,2
270 A$=INKEY$:IFA$=""THEN270
280 CLS:IFCO=3THENPRINT:PRINT
290 PRINT"ENTER THE NUMBER OF CH
ILDREN";
300 IFCO=3THEN PRINT" YOU WISH T
OPUT THROUGH COLLEGE":PRINT:ELSE
PRINT"    YOU WISH TO PUT THROUG
H COLLEGE":PRINT
310 SOUND150,2:LINEINPUT"
         ";NC$:NC=VAL(NC$):'NC=NUM
BER OF CHILDREN (TEN MAX W/O ADD
ING DIMENSION STATEMENTS)
320 IF NC=1THENPRINT:PRINT"WHAT
IS HIS/HER NAME?":GOTO340
330 PRINT:PRINT"WHAT ARE THEIR N
AMES?"
340 FORX=1TONC:SOUND150,2:LINEIN
PUT"      ";NM$(X):NEXT:'NM$(X)=N
AME OF CHILD(REN)
350 PRINT:SOUND150,2:IFCO=3THENP
RINT"ENTER WHAT YOU EXPECT THE A
VERAGE       INFLATION RATE TO B
E (%): ";:ELSEPRINT"ENTER WHAT Y
OU EXPECT THE       AVERAGE INFL
ATION RATE TO        BE (%): ";
360 LINEINPUT" ";IR$:IR=VAL(IR$)
/100:'IR=INFLATION RATE
370 PRINT:SOUND150,2:PRINT"ENTER
 WHAT INTEREST RATE YOU":PRINT"B
ELIEVE YOU COULD GET FOR":LINEIN
PUT"YOUR MONEY (%):  ";IT$:IT=VAL
(IT$)/100:'IT=INVESTMENT RATE
380 PRINT:SOUND150,2:IFCO=3THENP
RINT"ENTER THE AMOUNT OF MONEY Y
```

Telewriter-128™

the Color Computer 3 Word Processor

For over 5 years now, Telewriter has been the #1 Color Computer word processor, both in popularity and in performance. Telewriter's near perfect mix of sophisticated professional features and a very natural user interface, has earned it the highest praise in numerous magazines, and an intensely loyal following among tens of thousands of Color Computer users all over the world.

HISTORY

Throughout the history of the Color Computer, Telewriter has pioneered software breakthroughs that set the standards.

In 1981, it was Telewriter 1.0 that first took the Color Computer's inadequate 32X16 all-uppercase display, and replaced it with a graphics-based 51X24 upper and lowercase display.

A few years later, Telewriter-64 added high density 64X24 and 85X24 displays and access to the full 64K of the newer Color Computers.

THE NEW AGE

Today, Telewriter-64 is recognized as the standard Color Computer word processor. It runs on all Tandy Color Computers — from the original Color Computer 1, to the Color Computer 2, and 3.

But the Color Computer 3 brings a whole new level of power to low cost computing and, so, a new Telewriter is here to put that power to work for you. We call it Telewriter-128.

TELEWRITER-128

You don't mess with a good thing, so Telewriter-128 is still Telewriter-64 at heart. The commands, and the user interface are essentially the same. If you know Telewriter-64, then you already know Telewriter-128. And, if you don't know Telewriter-64, you'll still have an easy time learning and using Telewriter-128.

80 COLUMNS

But there are major differences as well. First, Telewriter-128 uses the Color Computer 3's new 80 column screen display.

This means, simply, that using Telewriter-128 on a low cost Color Computer 3 will look a lot like using a more expensive word processor on a much more expensive IBM PC, PS/2, or clone.

SPEED

Second, Telewriter-128 is lightning fast. Telewriter-64 was fast in its own right, but, by accessing the Color Computer 3's video hardware directly, and by running the machine in double speed mode, Telewriter-128 is able to provide extremely fast scrolling and instant paging — functions whose speed is crucial to serious word processing.

In this department, Telewriter-128 doesn't simply keep up with IBM-based word processors — it generally surpasses them!

EASE

Third, Telewriter-128 adds a host of new features big and small, that make it even easier to use.

Features like: Quick function key access to the editor or the menus — an instant on-line help screen summarizing all Telewriter commands and special characters — an option file where you store your personal set of format and screen settings so you only have to set them once!

Then, there's a quick save feature which allows you to save all your current work without leaving the editor. There's a simple way to cursor through the disk directory and read in a file by just hitting ENTER. And there's more.

NEW POWER

Telewriter-64 always had the power to handle any kind of serious writing, from letters to textbooks. But, here too, Telewriter-128 adds major features.

Like Macros — which let you insert whole words or phrases (even sets of control codes or format commands) into your text, with a single keypress. And every time you power up Telewriter-128, the macro definitions are automatically loaded*, so they're always there.

Then there's a Print Preview feature that shows you, on-screen, the way your printed text will look — with margins, headers, centering, justification, page numbering, and page breaks. This guarantees letter perfect documents every time, and makes tasks like widow/orphan line elimination, a breeze.

TELEWRITER-64 OR TELEWRITER-128

We could go on listing features, but the point is this: If you own a Color Computer, you already have the hardware for the most powerful, low cost word processor in town. All you need now is to add the heart and soul:

Telewriter-64, for the Color Computer 1 and 2, costs $59.95 on disk, $49.95 on cassette.

Telewriter-128 for the Color Computer 3 costs $79.95 on disk, $69.95 on cassette.

To order by Mastercard or Visa call (619) 755-1258 anytime, or send check or money order plus $2 shipping (Californians add 6% sales tax) to:

COGNITEC
704 Nob Ave.
Del Mar, CA 92014

To upgrade from Telewriter-64 to Telewriter-128, return your original disk or cassette with $39.95. (Add $10 if you're also upgrading from cassette to disk. Deduct $10 with proof of Oct '87 - Feb '88, purchase of Telewriter-64.)

> *When I first got Telewriter-64 last year, I was in heaven. I couldn't believe the program's versatility and ease of use.*
> -The RAINBOW, Oct. 1985

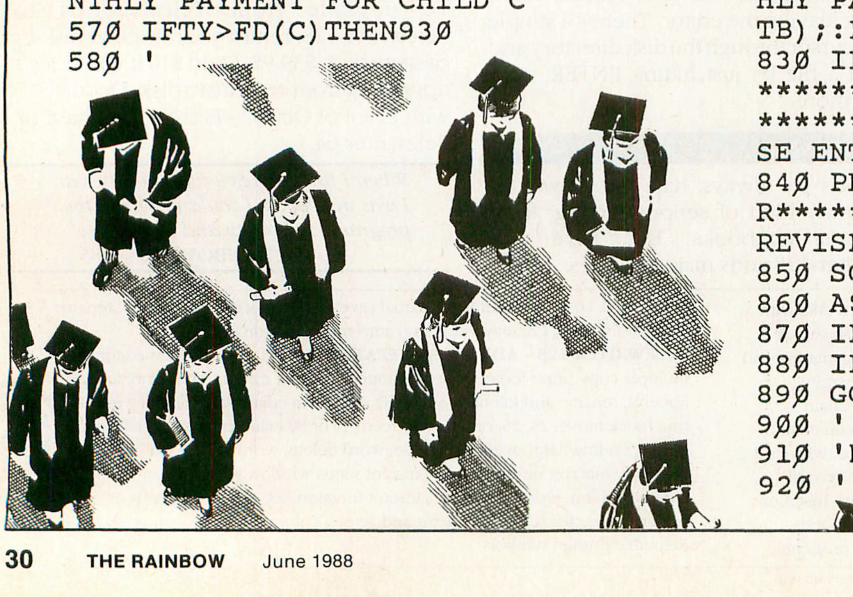
TELEWRITER-64 FEATURES: Compatibility with any printer that works with the Color Computer; embedded control codes for underlining, boldface, sub/superscript, variable fonts; format commands for headers, centering, margin and spacing changes anywhere in the document; Format menu to set margins, spacing, page numbering, BAUD rate, lines per page, justification; Chain printing for one shot printing of multi-file documents. Fast, full-screen editor with wordwrap, block copy/move/delete, global search and replace, wild card search, fast 4-way auto-repeat cursor, fast scrolling, forward and backward paging, text alignment, tabs, error protection, word and line counter. Insert or delete text anywhere on the screen. Simple, easy to remember commands. Optional ASCII files for compatibility with spell checkers, terminal programs, and BASIC. Load, save, append, partial save files to disk or cassette. Kill, rename and list disk files. Cassette verify and auto-retry on error.

TELEWRITER-128 - ADDITIONAL FEATURES: Print preview from editor; multiple copy print; footers; hanging indents; cursor thru disk directory to load, append, rename and kill files; quick file save from editor; keyclick; key repeat; true block move; 24, 25, or 28 line screen; 40 or 80 column screen; dual speed cursor; on-line help; overstrike mode; word delete; wordwrap at margin; user definable macros; nested macros; instant status window for information on cursor position, word count, etc.; instant function key access to menus or editor; options menu for setting character and screen colors, key repeat and delay rates, definable foreign symbols.

RAINBOW
CERTIFICATION SEAL

IBM and PS/2 are trademarks of International Business Machines Inc. *disk version only

```
OU WOULD LIKETO HAVE AVAILABLE A
T THE BEGINNING OF   EACH SCHOOL
 YEAR (IN SEPT): ";:GOTO400
390 PRINT"ENTER THE AMOUNT OF MO
NEY YOU   WOULD LIKE TO HAVE AVA
ILABLE    AT THE BEGINNING OF EA
CH SCHOOL YEAR (IN SEPT): ";
400 LINEINPUT"$";RA$:RA=VAL(RA$)
:'RA=REQUIRED AMOUNT PER CHILD P
ER YEAR
410 PRINT:SOUND150,2:PRINT"ENTER
 THE CURRENT MONTH (1-12):
";
420 IFCO=3THENPRINT"
   ";
430 LINEINPUT" ";TM$:TM=VAL(TM$)
:'TM=TODAY'S MONTH
440 IFTM<1ORTM>12THEN410
450 PRINT:SOUND150,2:LINEINPUT"E
NTER THE CURRENT YEAR: ";TY$:TY=
VAL(TY$):'TY=TODAY'S YEAR
460 IFTY<1987THEN450
470 IFCO=3THENLS=40:ELSELS=32
480 FORX=1TONC:CLS:PRINT"INFORMA
TION ABOUT ";NM$(X):PRINTSTRING$
(LS,"*"):PRINT:SOUND150,2:LINEIN
PUT"BEGINNING YEAR OF COLLEGE: "
;FD$(X):FD(X)=VAL(FD$(X)):'FD(X)
=FUTURE COLLEGE DATE FOR CHILD X
490 PRINT:SOUND150,2:PRINT"AMOUN
T AVAILABLE TO INVEST NOW      "
;:IFCO=3THENPRINT"          ";
500 LINEINPUT"$";OA$(X):OA(X)=VA
L(OA$(X)):NEXT:'OA(X)=ORIGINAL A
MOUNT AVAILABLE TO INVEST NOW FO
R CHILD X
510 '
520 'CALCULATION ROUTINE BEGINS
530 '
540 CLS:PRINT:PRINT:PRINT"CALCUL
ATIONS NOW BEING PERFORMED"
550 MT=0:'MT=MONTHLY PAYMENT TOT
AL
560 FORC=1TONC:MP(C)=0:'MP(C)=MO
NTHLY PAYMENT FOR CHILD C
570 IFTY>FD(C)THEN930
580 '
```



```
590 'T1 & T2 USED FOR NO OF PAYM
ENT PERIODS (MONTHS) CALCULATION
600 '
610 IFTY=FD(C)THENIFTM>8THEN930:
ELSET1=FD(C)-TM:GOTO670
620 T1=12-TM+9+(12*(FD(C)-TY-1))
630 AM(C)=OA(C):'SAVE ORIGINAL A
MOUNT AVAIL FOR POSSIBLE REVISIO
NS
640 '
650 'A1 & A2 USED FOR CALCULATIN
G INFLATION EFFECTS
660 '
670 A1=RA * ((1+(IR/12))^T1):IF
AM(C)<>0 THEN AM(C)=AM(C)*((1+(I
T/12))^T1)
680 IF AM(C) >A1 THEN AM(C)=AM(C
)-A1:GOTO700:ELSEA1=A1-AM(C):AM(
C)=0
690 MP(C)=A1*((IT/12)/(((1+(IT/1
2))^T1)-1))
700 T2=T1
710 FORX=1TO3
720 T2=T2+12:A2=RA*((1+(IR/12))^
T2):IF AM(C)<>0 THEN AM(C)=AM(C)
*((1+(IT/12))^12):IF AM(C)>A2 TH
EN AM(C)=AM(C)-A2:GOTO770:ELSEA2
=A2-AM(C):AM(C)=0
730 MP(C)=MP(C)+(A2*((IT/12)/(((
1+(IT/12))^T2)-1))):NEXTX,C
740 '
750 'SUMMARY SCREEN
760 '
770 CLS:PRINTIR*100;"% INFLATION
 ";:IFCO=3THENPRINT"          ";
780 PRINTIT*100;"% INTEREST":PRI
NTSTRING$(LS,"*"):PRINT"MONTHLY
AMOUNT REQUIRED FOR "
790 FORX=1TONC:PRINTTAB(9);NM$(X
);":";:PRINTTAB(12);:PRINTUSING"
$#####.##";MP(X)
800 MT=MT+MP(X):NEXT
810 IFCO=3THENTB=26:ELSETB=15
820 PRINT:PRINT:PRINT"TOTAL MONT
HLY PAYMENT REQUIRED:":PRINTTAB(
TB);:PRINTUSING"$#####.##";MT
830 IFCO=3THENLOCATE0,21:PRINT"*
****************ENTER***********
*******   <E> END       <R> REVI
SE ENTRIES";:LOCATE0,23:GOTO850
840 PRINT@448,"*************ENTE
R**************<E> END      <R>
REVISE ENTRIES";
850 SOUND150,2
860 A$=INKEY$:IFA$=""THEN860
870 IFA$="E"THENEND
880 IFA$="R"THEN1010
890 GOTO860
900 '
910 'DATE ENTRY ERROR
920 '
```

```
930 CLS:PRINTSTRING$(LS,"*"):PRI
NT:PRINT"TODAY'S DATE IS LATER T
HAN ";
940 IFCO=3THENPRINT"COLLEGE
 START DATE FOR:   ";:ELSEPRINT"
     COLLEGE START DATE FOR:":PR
INT"       ";
950 PRINTNM$(C):IFCO=3THENPT=15:
ELSEPT=6
960 FORX=1TOPT:PRINT:NEXT:PRINT"
   ENTER <R> TO REVISE":PRINTSTR
ING$(LS,"*"):SOUND150,2
970 A$=INKEY$:IFA$=""THEN970ELSE
IFA$<>"R"THEN970:ELSECLS:GOTO410
980 '
990 'REVISION MENU
1000 '
1010 CLS:IFCO<>3THENPRINT"******
******REVISION************":ELSE
PRINT"****************REVISION**
**************"
1020 PRINT:PRINT:PRINTTAB(4)"1.
CHANGE INFLATION RATE":PRINTTAB(
4)"2. CHANGE INTEREST RATE":PRIN
TTAB(4)"3. CHANGE ANNUAL AMT AVA
IL"
1030 PRINTTAB(4)"4. RECALCULATE"
:IFCO=3THENPRINT:PRINT:PRINT
1040 PRINT:PRINTTAB(8)"ENTER 1,
2, 3, OR 4"
1050 PRINTSTRING$(LS,"*"):PRINT"
  CURRENT SETTINGS:":GOSUB1270:P
RINT"         1=";IR*100;"%":GOS
UB1270:PRINT"          2=";IT*100
;"%":GOSUB1270:PRINT"         3=
 ";:PRINTUSING"$#####.##";RA;
1060 SOUND150,2
1070 A$=INKEY$:IFA$=""THEN1070
1080 ONVAL(A$)GOTO1120,1180,1240
,540
1090 '
1100 'INFLATION RATE REVISION
1110 '
1120 CLS:IFCO=3THENPRINT"*******
******INFLATION RATE************
*":LOCATE5,18:PRINT"CURRENT RATE
 = ";IR*100;"%":LOCATE11,5:PRINT
"ENTER":LOCATE5,6:GOTO1140
1130 PRINT"*********INFLATION RA
TE*********":PRINT@455,"CURRENT
RATE = ";IR*100;"%":PRINT@105,"E
NTER":PRINT@131,"";
1140 SOUND150,2:LINEINPUT"NEW IN
FLATION RATE (%): ";IR$:IR=VAL(I
R$)/100:GOTO1010
1150 '
1160 'INVESTMENT RATE REVISION
1170 '
1180 CLS:IFCO=3THENPRINT"*******
******INVESTMENT RATE***********
*":LOCATE6,16:PRINT"CURRENT RATE
 = ";IT*100;"%":LOCATE12,5:PRINT
"ENTER":LOCATE6,6:GOTO1200
1190 PRINT"********INVESTMENT RA
TE*********":PRINT@455,"CURRENT
RATE = ";IT*100;"%":PRINT@106,"E
NTER":PRINT@130,"";
1200 SOUND150,2:LINEINPUT"NEW IN
VESTMENT RATE (%): ";IT$:IT=VAL(
IT$)/100:GOTO1010
1210 '
1220 'ANNUAL AMOUNT REVISION
1230 '
1240 CLS:IFCO=3THENPRINT"*******
******ANNUAL AMOUNT*************
*":LOCATE5,18:PRINT"CURRENT AMOU
NT  ";:PRINTUSING"$#####.##";RA:
LOCATE5,4:PRINT"ENTER NEW ANNUAL
 AMOUNT TO":PRINT"     BE AVAILA
BLE:  ";:GOTO1260
1250 PRINT"*********ANNUAL AMOUN
T**********":PRINT@450,"CURRENT
AMOUNT ";:PRINTUSING"$#####.##";
RA:PRINT@130,"NEW ANNUAL AMOUNT
TO BE           AVAILABLE:  ";
1260 SOUND150,2:LINEINPUT"$";RA$
:RA=VAL(RA$):GOTO1010
1270 IFCO=3THENPRINT:RETURN:ELSE
RETURN
```

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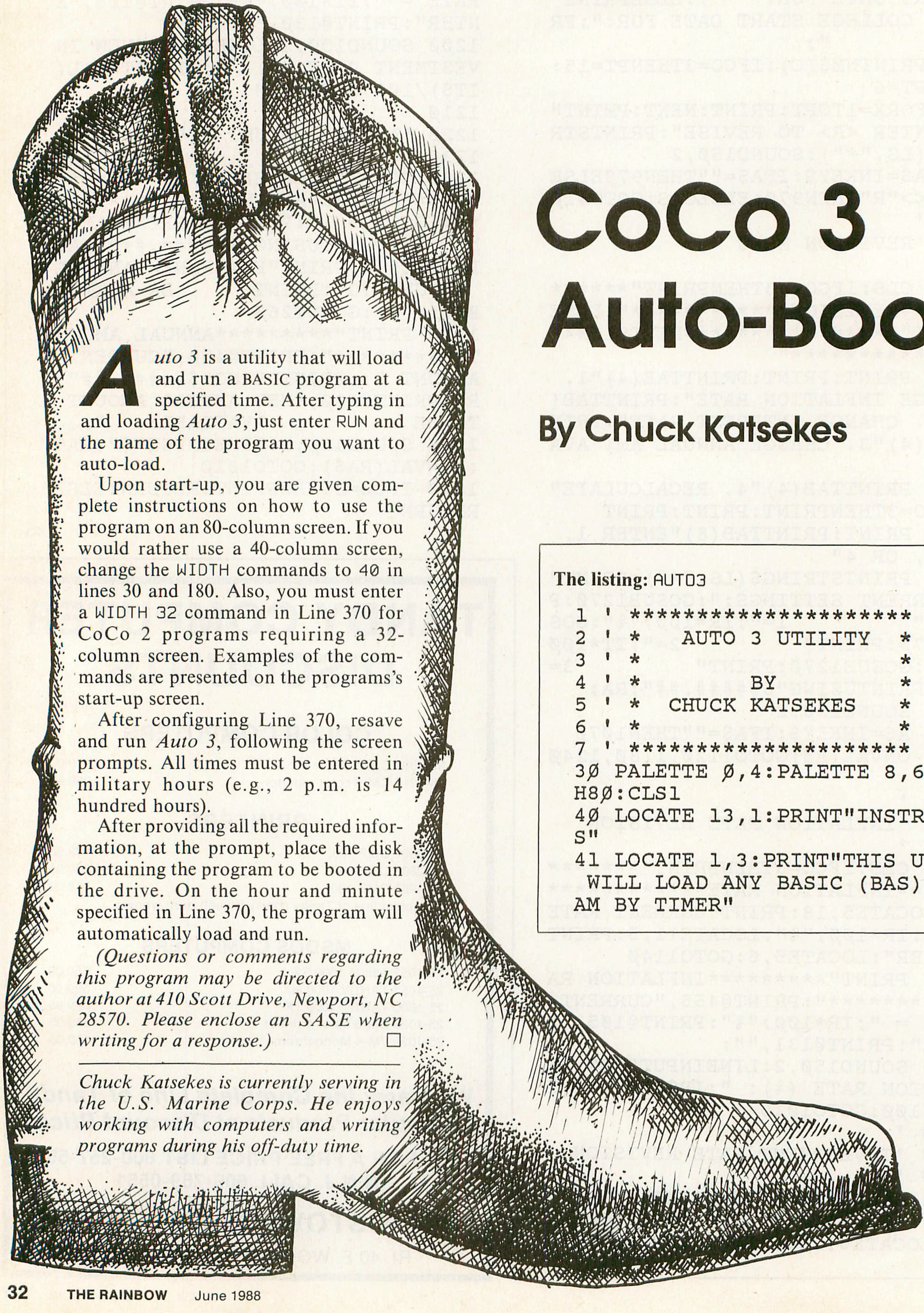
CoCo 3 Auto-Boot

By Chuck Katsekes



Auto 3 is a utility that will load and run a BASIC program at a specified time. After typing in and loading *Auto 3*, just enter `RUN` and the name of the program you want to auto-load.

Upon start-up, you are given complete instructions on how to use the program on an 80-column screen. If you would rather use a 40-column screen, change the `WIDTH` commands to `40` in lines 30 and 180. Also, you must enter a `WIDTH 32` command in Line 370 for CoCo 2 programs requiring a 32-column screen. Examples of the commands are presented on the programs's start-up screen.

After configuring Line 370, resave and run *Auto 3*, following the screen prompts. All times must be entered in military hours (e.g., 2 p.m. is 14 hundred hours).

After providing all the required information, at the prompt, place the disk containing the program to be booted in the drive. On the hour and minute specified in Line 370, the program will automatically load and run.

(Questions or comments regarding this program may be directed to the author at 410 Scott Drive, Newport, NC 28570. Please enclose an SASE when writing for a response.) ☐

Chuck Katsekes is currently serving in the U.S. Marine Corps. He enjoys working with computers and writing programs during his off-duty time.

The listing: `AUTO3`

```
1 ' *********************
2 ' *   AUTO 3 UTILITY  *
3 ' *                   *
4 ' *         BY        *
5 ' *  CHUCK KATSEKES   *
6 ' *                   *
7 ' *********************
30 PALETTE 0,4:PALETTE 8,63:WIDT
H80:CLS1
40 LOCATE 13,1:PRINT"INSTRUCTION
S"
41 LOCATE 1,3:PRINT"THIS UTILITY
 WILL LOAD ANY BASIC (BAS) PROGR
AM BY TIMER"
```

```
42 LOCATE 1,4:PRINT"IT WILL LOAD
 BOTH COCO II AND COCO III PROGR
AMS."
43 LOCATE 1,5:PRINT"TO LOAD COCO
 II PROGRAMS YOU CAN EITHER PLAC
E WIDTH32"
44 LOCATE 1,6:PRINT"AT THE BEGIN
NING OF THE PROGRAM YOU WANT TO
LOAD, OR
45 LOCATE 1,7:PRINT"PLACE WIDTH3
2 AFTER THE CLS IN LINE 370"
46 LOCATE 1,8:PRINT"YOU MUST HOW
EVER, ENTER THE NAME OF THE PROG
RAM YOU"
47 LOCATE 1,9:PRINT"WANT TO AUTO
 LOAD AFTER THE (RUN) IN LINE 37
0"
48 LOCATE 1,10:PRINT"SEE THE EXA
MPLE BELOW.....................
."
49 LOCATE 1,13:PRINT"(FOR COCO I
I PROGRAM)"
50 LOCATE 1,14:PRINT"370 CLS:WID
TH32:RUN'DEMO"
51 LOCATE 1,16:PRINT"(FOR COCO I
II PROGRAM)"
52 LOCATE 1,17:PRINT"370 CLS:RUN
'DEMO"
53 LOCATE 5,22 :PRINT"PRESS <ENT
ER> TO CONTINUE"
54 E$=INKEY$:IF E$="" THEN 54:GO
TO 55
55 CLS:LOCATE 1,6:PRINT"TO CHANG
E LINE 370 PRESS <BREAK> KEY AND
 TYPE"
56 LOCATE 1,7:PRINT"LIST 370. MA
KE THE APPROPRIATE CHANGES PRESS
"
57 LOCATE 1,8:PRINT"<ENTER> THEN
 TYPE RUN. FOLLOW THE PROMPTS AF
TER"
58 LOCATE 1,9:PRINT"TYPING RUN..
...................."
59 LOCATE 1,13:PRINT"PRESS <ENTE
R> TO START PROGRAM"
60 LOCATE 1,15:PRINT"PRESS <BREA
K> TO CHANGE LINE 370"
70 E$=INKEY$:IF E$=""THEN 70:GOT
O 170
170 CLS
180 PALETTE 0,8:PALETTE 8,63:WID
TH80:CLS1
190 CLS
200 INPUT "PROGRAM";P$
210 INPUT "HOUR";H
220 INPUT "MINUTES";M
230 INPUT "START HOUR";SH
240 INPUT "START MINUTE";SM
250 CLS
260 LOCATE 10,12:PRINT"* * *   L
OADING ";P$;" @    ";SH;":";SM;"
 * * *"
270 FOR H = H TO 23
280 FOR M = M TO 59
290 FOR S = O TO 59
300 IF H=SH AND M=SM THEN GOTO 3
70
310 LOCATE 1,2:PRINTH;:LOCATE11,
2:PRINTM;:LOCATE21,2:PRINTS;:LOC
ATE0,2
320 FOR T = 1 TO 493
330 NEXT T
340 NEXT S
350 NEXT M
360 NEXT H
370 CLS:RUN"
380 END
```

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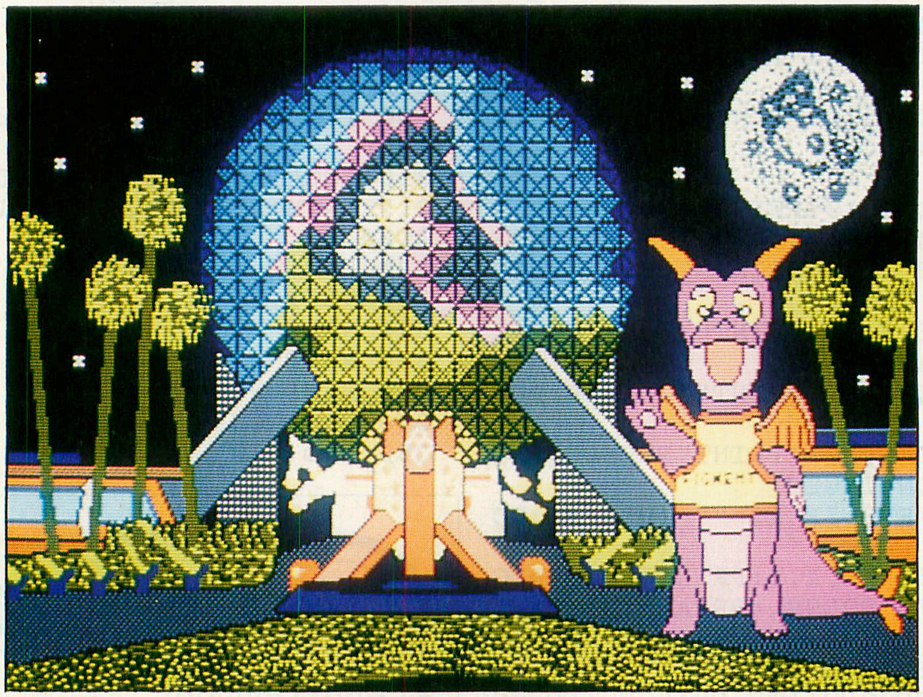
CoCo Gallery

1st

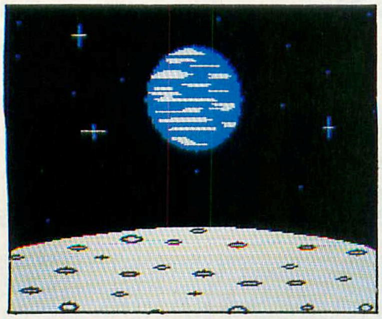
CoCo 3



Figment **John Owens**

Planning a summer vacation? This graphic illustration of Epcot Center in Florida may influence your decision as to where you vacation. John lives in Rome, New York, and used *Color Max 3* to create this view of a popular vacation spot.

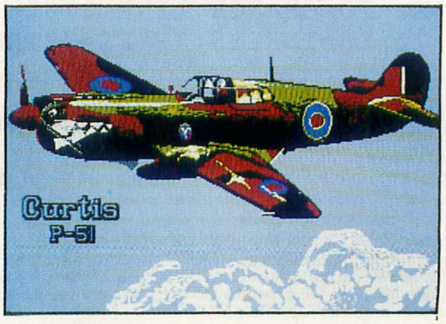
Honorable Mention



Lunar Scape **Jeff Edlund**

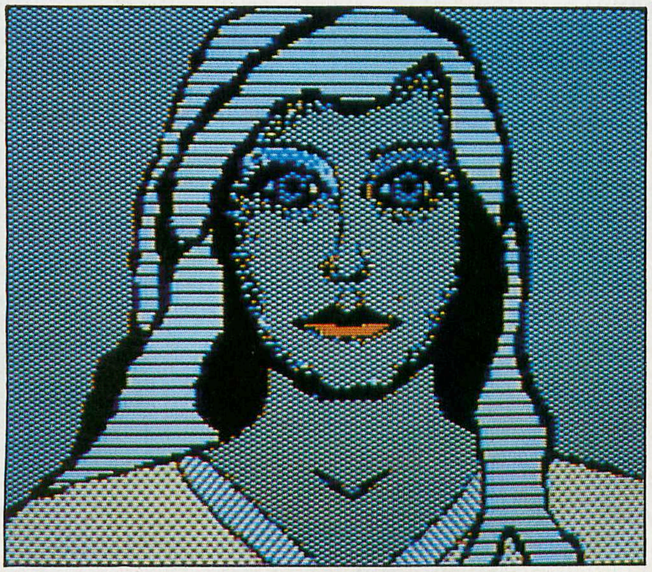
This view of outer space was produced in BASIC on the CoCo 2. Jeff, of Crystal, Minnesota, enjoys making model airplanes and driving radio-controlled cars.

3rd



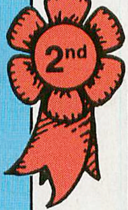
Curtis P-51 **Chuck Nivison**

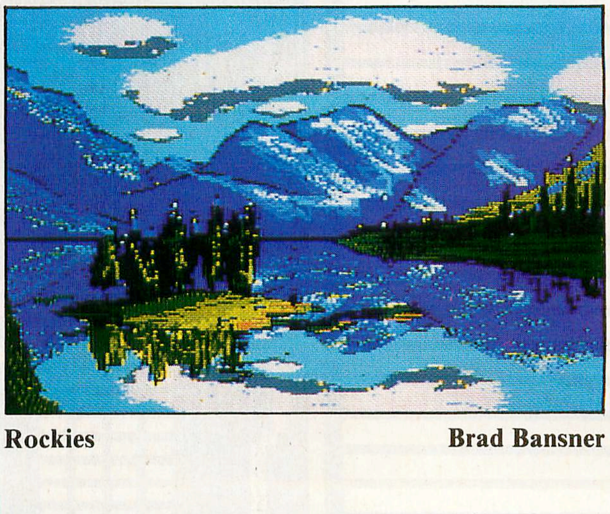
This view of the plane used primarily in World War II was developed with *Color Max 3*. Chuck, of Clarksville, Michigan, is a college student who uses his CoCo for playing games, data processing and file organization.



Athena **Troy Graham**

This queen of goddesses from Greek mythology was created with *CoCo Max II*. Troy, of Arnold, Maryland, is 16 years old, writes programs for himself and would like to make programming a career someday.





Rockies **Brad Bansner**

Brad, of Wyomissing, Pennsylvania, used *Color Max Deluxe* to create this mountainous view. He is a sophomore in high school who enjoys long-distance running and working with graphics on the CoCo.

SHOWCASE YOUR BEST! You are invited to nominate original work for inclusion in upcoming showings of "CoCo Gallery." Share your creations with the CoCo Community! Be sure to send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.) and how to display it. Also, please include a few facts about yourself.

Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is *not* an original work.

We will award two first prizes of $25, one for the CoCo 3 and one for the CoCo 1 and 2; one second prize of $15 and one third prize of $10. Honorable Mentions may also be given.

Please send your entry on either tape or disk to the CoCo Gallery, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. Remember, this is a contest and your entry will not be returned.

— Angela Kapfhammer, Curator

A musicial view of Nashville

CoCo Goes Country

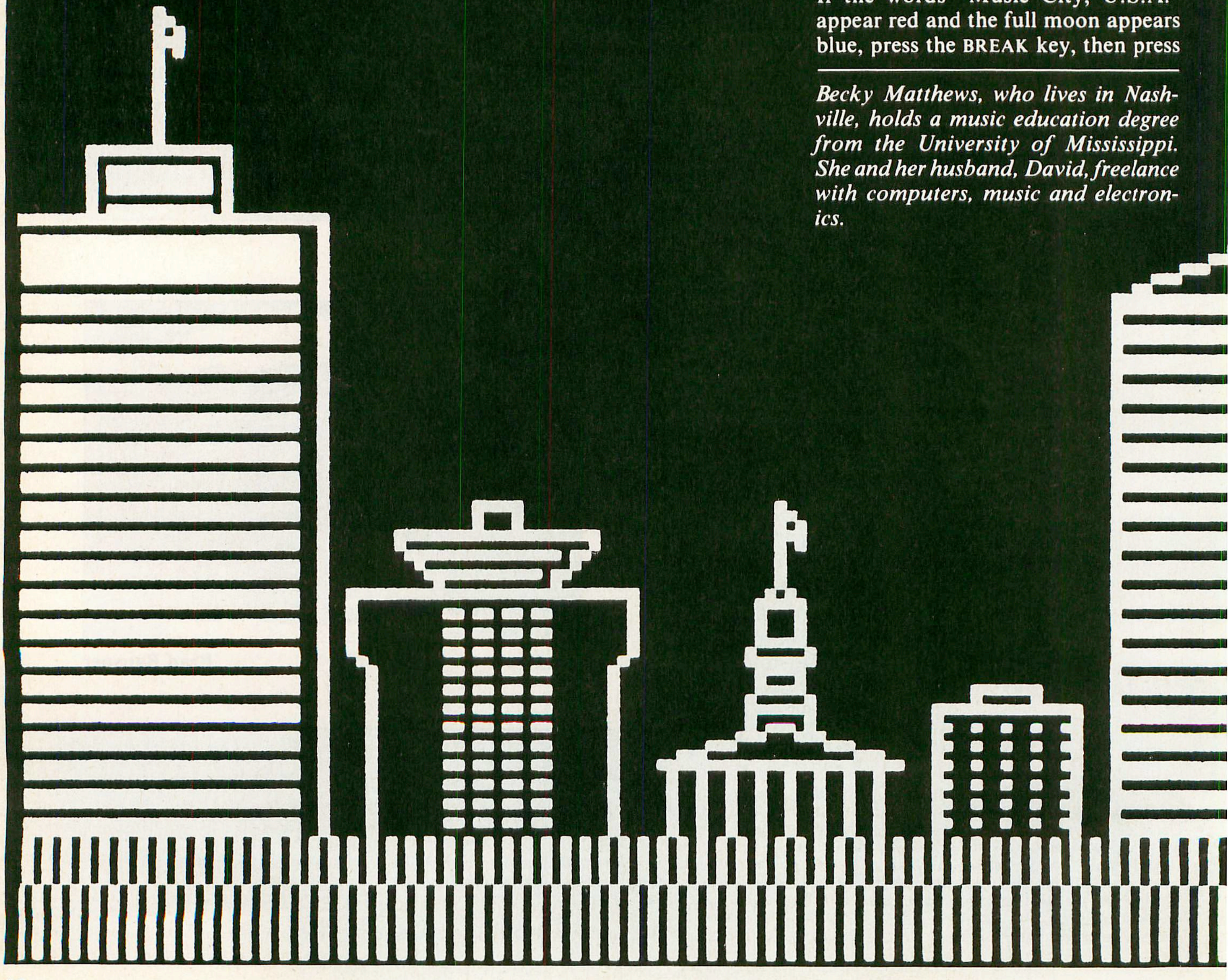
By Becky F. Matthews

Ask any country music fan, "Where is Music City, U.S.A.?" You will hear the reply, "Nashville, Tennessee!" And what song captures the down-home flavor of traditional country music better than "Rockytop"? If you have never had the opportunity to visit Music City, U.S.A., now's your chance. Come on, y'all! Run *Rockytop* and you can view the Nashville skyline and feast your ears on a CoCo rendition of the song "Rockytop." Grab your partner and clog, buck-dance or two-step till the cows come home.

Rockytop uses `DRAW`, `LINE`, `CIRCLE`, `PSET`, and `PAINT` commands to draw the city of Nashville. The false red/blue colors of `PMODE4,1` are used. If the words "Music City, U.S.A." appear red and the full moon appears blue, press the **BREAK** key, then press

---

Becky Matthews, who lives in Nashville, holds a music education degree from the University of Mississippi. She and her husband, David, freelance with computers, music and electronics.



the reset button on the back of your computer, type RUN and press ENTER. Do this until the words are blue and the moon red. CoCo 3 users will see this resolution screen in black and white. Also, CoCo 3 users should edit Line 30 to read POKE 65497,0 (the CoCo 3 high speed poke) instead of POKE 65495,0. To edit Line 30 CoCo 3 users should type EDIT 30 and press ENTER. Type 2S5 to search for the second occurrence of the number 5. Then type C7 to change that 5 to a 7. Press ENTER to end the editing.

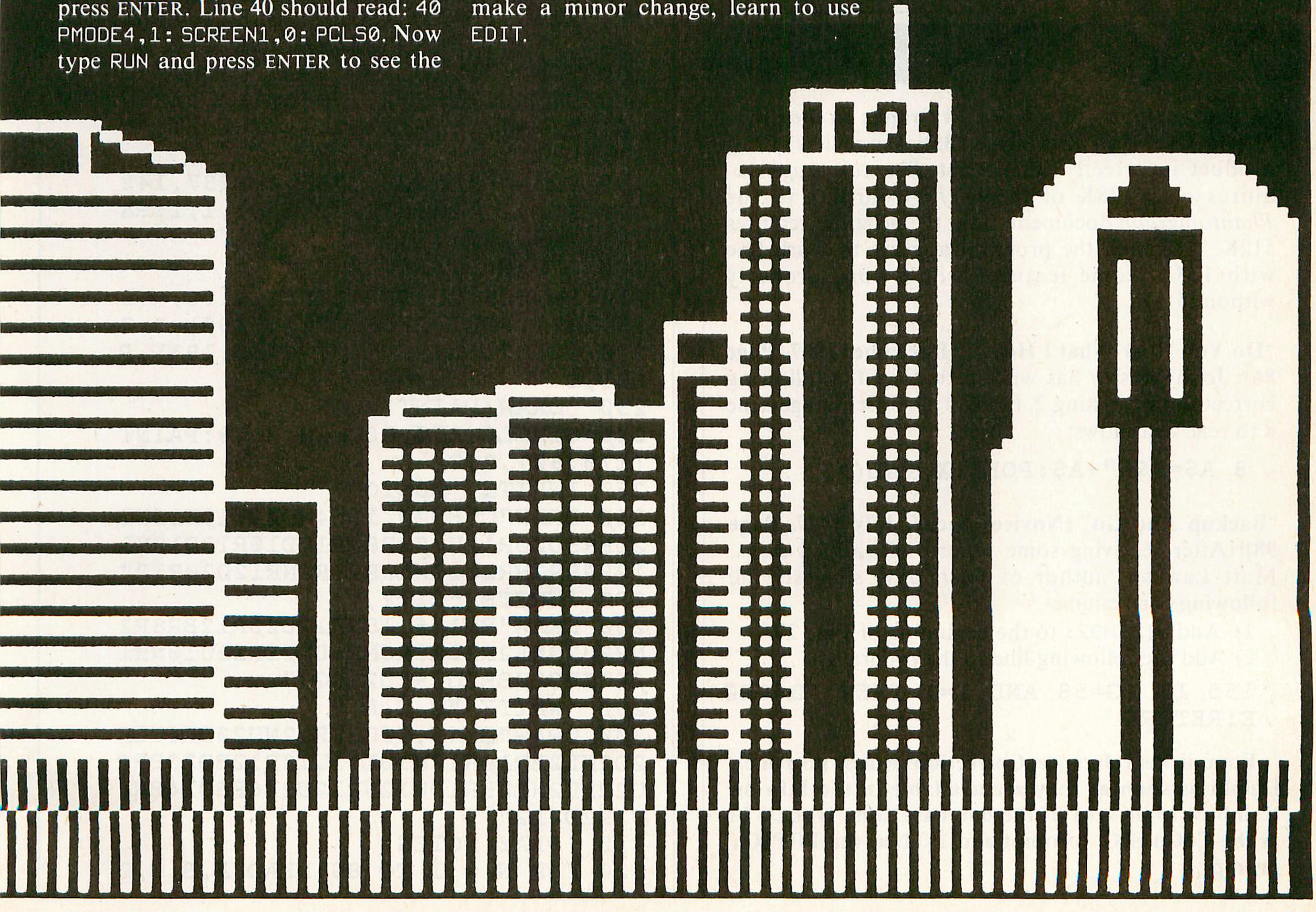
Now let's see what colors the Music City skyline will be using different graphics screens. (The following changes will display some interesting color combinations for the skyline on all CoCo models, CoCo 3 included.) First we'll try the other screen of PMODE4. Type EDIT 40 and press ENTER. Type 3S1 to search for the third occurrence of the number 1. Type C0 to change that 1 to a 0 and press ENTER. Line 40 should read: 40 PMODE4,1: SCREEN1,0: PCLS0. Now type RUN and press ENTER to see the skyline on the new graphics screen, PMODE4,1:SCREEN1,0. Press BREAK when ready to continue, and use EDIT to see the skyline in other colors. Change the first part of Line 40 from PMODE4,1 to PMODE3,1 by typing EDIT 40 and pressing ENTER, then S4, C3 and press ENTER. Once again, run *Rockytop* to see the colors of PMODE3,1:SCREEN 1,0.

There is one more graphics screen that works well with this program. Edit Line 40 with the method we have been using to change PMODE3,1 :SCREEN1,0 to PMODE3,1:SCREEN 1,1 and run to see the last color combination we will try. (This combination is especially nice on the CoCo 3's color monitor.) If you want to return to the original colors, change Line 40 back to PMODE4,1: SCREEN1,1:PCLS0 (using EDIT, of course). Becoming familiar with the EDIT commands can save you time. Instead of retyping a whole line to make a minor change, learn to use EDIT.

The music routine for *Rockytop* begins at Line 310. Line 320 reads the note and duration values from DATA statements (lines 370 through 580) and then plays the notes with SOUND statements. The notes are arranged in three-note groups (A, B and C) followed by their duration value (D). These note groups are played as arpeggios (the tones of the chord played in rapid succession instead of simultaneously), and 89 groups make up the song. After the computer reads the DATA statements, it "forgets" them. Line 340 restores the data so the song can be played again. Line 350 returns to the start of the music routine to play the song again.

Of course, truckers call Nashville "Guitar," but that's another story.

(Questions or comments regarding this program may be directed to the author at 6729 Waller Road, Brentwood, TN 37027. Please enclose an SASE when requesting a reply.) □



120	104	490	34
200	63	END	63
390	69		

The listing: `ROCKYTOP`

```
10 '**ROCKYTOP ARRANGED BY BECKY
 F. MATTHEWS
20 'SPEED-UP POKE
30 POKE65495,0
40 PMODE4,1:SCREEN1,1:PCLS0
50 'DRAW BUILDINGS
60 DRAW"C1BM213,115S3L2G1D5R3BR2
BU2U2BR3U2E1NR2G1D4F1R2"
70 DRAW"S4BM0,114C1ND64R10NR14U7
R7U14F2D2H2D12R7D7R10D64BR5U18H2
U6R9NR18U2NR10L1H1U1NR14L1H1U1R8
NR4U3R4D3R8D1G1L1D1G1L1D2R8D6G2D
18BR6U8NR20BR3D8BR3U8BR3D8BR3U8B
R3D8BR3U8BR3D8"
80 DRAW"C1BM69,170M81,166M93,170
BM78,166U2NR6U1E1NR4U2NR4H1NR5U1
E1NR4U4NR4E2U8F2D2H2D6F2D4F1D1G1
D2F1D4BD11BR13U14R4NR8U2R6D2R4D1
4BR4U56NR36M+13,-5ND5R10ND5M+13,
+5D55BR10U25NL10"
90 DRAW"C1BM166,177U32R2NR10U2R1
0ND34U1R10D2NL10R6ND34U4NR6U4R6N
D41U16R6ND58NR12U6R3ND6R7NU8R4D6
L8D58R8NU58BR5U30E2U20M+6,-6R14M
+6,+6D20F2D30BL16U32BR3ND32BL6ND
32L2U20NR10M+4,-6R3M+4,+6D20L2BU
20R2R3F1R3F1BL26E1R3E1R3"
100 'DRAW WINDOWS
110 COLOR0,1:LINE(12,109)-(22,11
1),PRESET,BF:LINE(12,113)-(22,11
4),PRESET,BF:LINE(3,116)-(31,120
),PRESET,BF
120 FORY=122TO176STEP3:LINE(3,Y)
-(31,Y+1),PRESET,BF:NEXTY
130 PAINT(244,123),1,1:PAINT(234
,123),1,1:FORY=154TO178STEP2:FOR
X=47TO56STEP3:LINE(X,Y)-(X+1,Y),
PRESET:NEXTX:NEXTY
140 FORY=166TO178STEP2:FORX=98TO
110STEP3:PSET(X,Y,1):NEXTX:NEXTY
150 FORY=122TO177STEP3:LINE(115,
Y)-(150,Y+1),PRESET,BF:NEXTY:FOR
Y=156TO177STEP3:LINE(151,Y)-(158
,Y+1),PRESET,BF:NEXTY
160 FORY=148TO176STEP2:FORX=167T
O176STEP3:LINE(X,Y)-(X+1,Y),PRES
ET:NEXTX:NEXTY:FORY=147TO177STEP
2:FORX=179TO193STEP3
170 LINE(X,Y)-(X+1,Y),PRESET:NEX
TX:NEXTY:FORY=142TO176STEP2:LINE
(197,Y)-(200,Y),PRESET:NEXTY
180 FORY=122TO176STEP2:FORX=201T
O206STEP2:LINE(X,Y)-(X,Y),PRESET
:LINE(X+12,Y)-(X+12,Y),PRESET:NE
XTX:NEXTY
190 DRAW"C1BM220,178R40BM237,142
U12BR5D12":PAINT(230,170),1,1:PA
INT(245,170),1,1
200 'DRAW STREET
210 PMODE3:COLOR2:LINE(0,178)-(2
55,182),PSET,BF:PAINT(5,190),3,2
220 COLOR1:LINE(1,0)-(255,191),P
SET,B
230 'DRAW/PAINT MOON
240 CIRCLE(170,80),20,2,.9:PAINT
(170,80),2,2
250 'WRITE "MUSIC"
260 DRAW"C3BM20,15S4ND20F10E10ND
20BR8D20R12U20BR8NR12D10R12D10NL
12BR8R2NR2U20NL2R2BR8NR12D20R12"
270 'WRITE "CITY,"
280 DRAW"BM156,15NR12D20R12BR8R2
NR2U20NL2R2BR8R6NR6D20BR22U10NH1
0E10BD20BR2U2R2D2L2G3"
290 'WRITE "U.S.A."
300 DRAW"BM40,50D20R12NU20BR6U2R
2D2NL2BR10R12U10L12U10R12BD20BR6
U2R2D2NL2BR10U12NR12U2E6F6D14BR6
U2R2D2L2"
310 'PLAY NOTES
320 FOR N = 1 TO 89:READ A,B,C,D
```

Corrections

"Phantomgraph — Professional Graphs on the CoCo 3" (Review, April 1988, Page 135): The review of this product incorrectly states that *Phantomgraph* requires only 128K of memory. According to the *Phantomgraph* documentation, the program requires 512K. Although the program appears to work fine with 128K, some features won't work properly without 512K.

"Do You Hear What I Hear?" (December 1987, Page 86): John Mosley has written to offer the following correction for Listing 2, `MLEDITOR`. Just change Line 8 to read as follows:

```
8 A$="&H"+A$:POKE X,VAL(A$)
```

"Backup And Go" (Novices Niche, July 1987, Page 98): After receiving some reports of garbled disks, Matt Lawson, author of *FastCopy*, suggests the following corrections:

1) Add `WIDTH32:` to the beginning of Line 20.
2) Add the following line to the program:

```
155 IF PG=58 AND I=1 THEN AD=&H0
E:RETURN
```

For quicker reference, Corrections will be posted on Delphi as soon as they are available in the Info on Rainbow topic area of the database. Just type `DATA` at the CoCo SIG> prompt and `INFO` at the TOPIC> prompt.

Two-Liner Contest Winner . . .

If factoring numbers is a pastime of yours, this two-liner should be a timesaver.

The listing:

```
0 SOUND10,3:CLS:PRINT" --==::**
FACTOR TREE **::==--":PRINT:INPU
T"ENTER ANY POSITVE WHOLE NUMBER
  NOT = TO 0";N:PRINT"A FACTOR T
REE FOR THE NUMBER"N"  WOULD BE:
":PRINT"1 ";:FORX=2TON-1
1 IFN/X=INT(N/X)THENN=N/X:PRINT"
*"X;:GOTO1ELSENEXTX:IFX=N THEN P
RINT"*" N
```

Ed Westberg
Jensen Beach, FL

(For this winning two-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

One-Liner Contest Winner . . .

Experiment with radius and degrees to have fun with circles in PMODE 4.

The listing:

```
0 CLS:PRINT"CIRCLES":INPUT"STEP
(DEG.)";S:INPUT"CIRCLE RADIUS";R
C:INPUT"RADIUS (PATH)";L:PMODE4:
PCLS:SCREEN1:FORD=0TO-360STEP-S:
R=D/57.29577951:X=INT(COS(R)*L+.
5):Y=INT(SIN(R)*L+.5):CIRCLE(X+1
28,Y+96),RC:NEXTD:FORA=1TO2STEP0
:IFINKEY$<>""THEN0ELSENEXT
```

Darin Herr
Ephrata, PA

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

One-Liner Contest Winner . . .

This one-liner prints out a chart that shows Celsius-to-Fahrenheit conversions.

The listing:

```
0 CLS:INPUT"DEGREE TO START AND
STOP AT";S,T:INPUT"DEGREE INCREM
ENT";I:IF I=0 THEN I=1 ELSE PRIN
T#-2,"DEG. CELIUS         DEG. FAH
REN.":FORC=S TO T STEP I:F=(C*9)
/5+32:PRINT#-2,USING"  ###   ..
.........  ###";C,F:NEXTC
```

Charles Farris
APO, NY

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

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```
:SOUND A,D:SOUND B,D:SOUND C,D
330 NEXT N
340 RESTORE
350 GOTO320
360 'NOTE DATA
370 DATA 147,170,185,2,108,170,1
85,2,147,170,185,2,108,170,185,2
380 DATA 147,176,193,2,89,176,19
3,2,147,170,185,1,108,147,170,1,
78,108,147,2
390 DATA 78,108,147,2,108,147,17
0,2,89,108,159,1,78,108,147,1,89
,108,159,2
400 DATA 108,147,170,2,147,170,1
85,2,170,185,204,1
410 DATA 108,185,108,1,125,193,1
25,1,140,200,140,1
420 DATA 147,170,185,2,108,170,1
85,2,147,170,185,2,108,170,185,2
430 DATA 147,176,193,2,89,176,19
3,2,147,170,185,1,108,147,170,1,
78,108,147,2
440 DATA 78,108,147,2,108,147,17
0,2,89,108,159,1,78,108,147,1,89
,108,159,2
450 DATA 78,108,147,1,32,147,32,
1,78,170,78,1,108,185,108,1,147,
204,147,1
460 DATA 147,204,147,1,140,200,1
40,1,147,204,147,1
470 DATA 125,170,193,2,78,170,19
3,2,125,170,193,2,78,170,193,2
480 DATA 108,159,185,2,58,159,18
5,2,108,159,185,2,108,143,159,2
490 DATA 133,176,197,2,89,176,19
7,2,133,176,197,1,89,176,193,2,1
33,159,185,1
500 DATA 89,176,193,2,89,125,147
,1,32,147,185,1,89,147,176,2,32,
89,125,2
510 DATA 147,176,193,2,32,89,125
,2,147,176,193,2,32,89,125,2
520 DATA 32,170,185,1,32,147,170
,1,32,108,147,2,32,147,32,1,32,1
47,32,1,78,170,78,1,108,185,108,
1
530 DATA 32,78,147,1,32,78,147,1
,32,78,147,2
540 DATA 5,89,159,2,58,89,159,2
550 DATA 32,78,147,2,32,147,32,2
,78,170,78,2,108,185,108,2
560 DATA 32,78,147,1,32,78,147,1
,32,78,147,2
570 DATA 5,89,159,2,58,89,159,2
580 DATA 32,78,147,2,32,147,32,2
,78,170,78,2,108,185,108,2
```

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This appears to be a side window. The curtains are drawn and I can make out the figure of a man inside.
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EXITS: W
COMMAND? LOOK WINDOW

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A music "processor"
to help you create and edit your own songs

Color Composer

By Garry L. Shelton

Want to write a song? Wishing for an easier way to do it? If you've ever written music for BASIC's `PLAY` statement, then you know how tiring it can be.

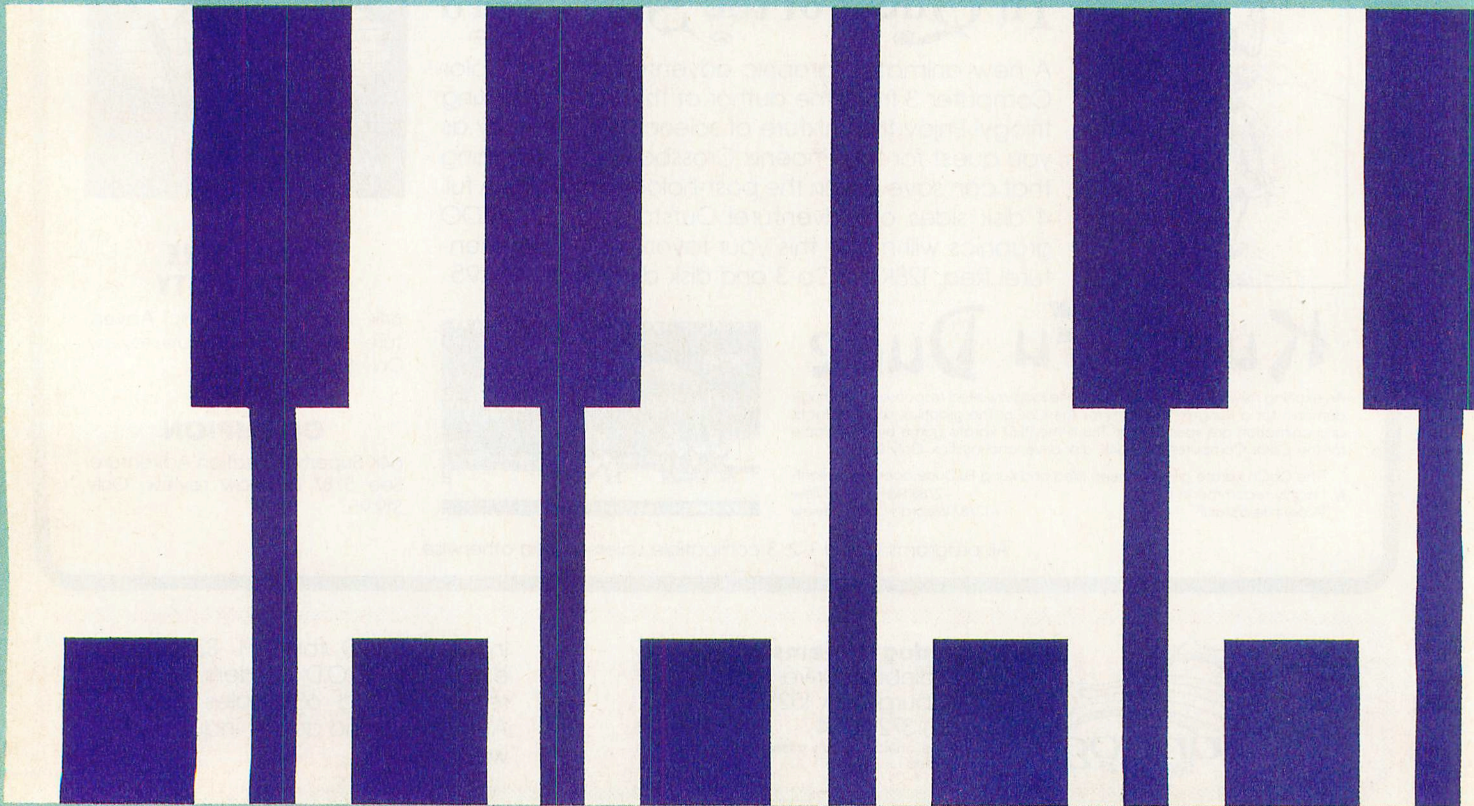
Song Writer helps you develop a tune faster and easier than "by hand," remembers tunes as they are typed in and lets you edit them if you make a mistake. Tunes can even be saved to tape and reloaded for future use.

To use *Song Writer*, you must have a 32K Color Computer with Extended Color BASIC. Simply load and run to start. I have used `POKE 65495,0` and `POKE 65494,0` in several lines to speed up program execution. If your system cannot handle these, they should be deleted from lines 100, 1050, 1110, 1400, 1440, 1450, 1460 and 1480.

As the program begins, you are greeted by the introductory screen

---

Garry Shelton is a brokerage consultant for a life insurance company, where he handles computer operations within the office. His wife is the inspiration for most of his computer projects, and their two-year-old child is already "interested" in the keyboard.



accompanied by a short melody. The main screen automatically follows, displaying octave, note length, tempo, stanza number, learn mode and piano keyboard. The letters on the piano keyboard correspond to the computer keys that are to be used. Table 1 lists the initial values used, range of values and the commands used to change these.

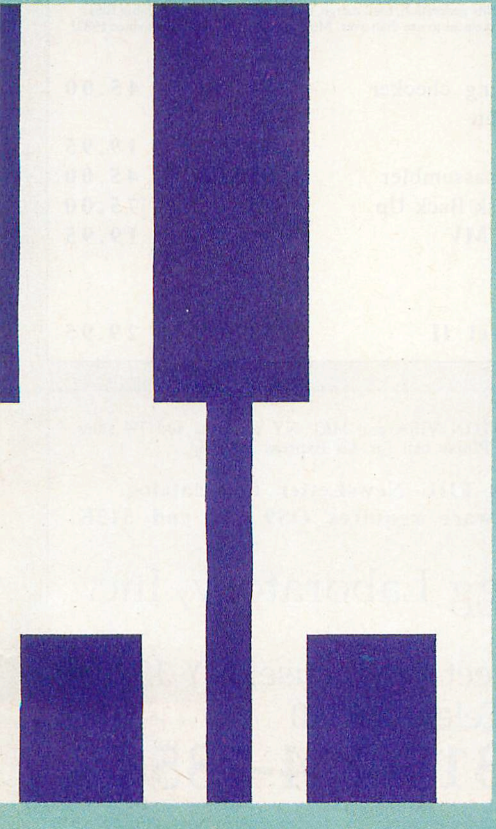
Octave	Initially set at middle C octave of two. Ranges from one to five. Increase using up arrow key; decrease using down arrow key.
Note Length	Initial length of four. Ranges from 1 to 64 where: 1=whole note, 2=half note, 3=¾ note, 4=quarter note, 8=eighth note, 16=16th note, 32=32nd note, 64=64th note. Increase using left arrow key; decrease using right arrow key.
Tempo	Initially set at two. Ranges from 1 to 255. Press hyphen key, type the value and press ENTER.
Rest	Value is always same as note length. Press space bar.

Table 1: Music Functions

The term "stanza" does not mean the same here as in sheet music: A stanza for our purposes means a string of 90 characters or less. If you exceed the allowed number of characters in a string, the stanza count is advanced one; and you begin a new string. You may have up to 25 stanzas in one song.

Learn Mode

Initially, this feature is set to off but may be toggled on by using the @ key. When it is off, *Song Writer* may be used for practice or as a "piano" of sorts and will not remember anything that is typed. To "play for real," just turn on the learn mode and type away. You will notice that the notes, tempo, octave, rests and note length are displayed as you type. One nice aspect of the learn mode is that it may be toggled on and off in the middle of a song. This way you may practice awhile, then turn on the learn mode and play the perfected portion. It is important to remember that when you are switching between on and off, any values for octave, note length and tempo must be displayed on the screen; otherwise they will not be remembered by the program.



The help screen aids you in recalling the various keys used to control different functions. Press the SHIFT and up arrow keys to access this screen. It lists the keys and their uses.

Sub-Menu Options

To access *Song Writer*'s other functions, press the CLEAR key to bring up the sub-menu, where any of the following options may be selected by presing the first letter of that option:

- Edit song — brings up the edit screen and displays the first stanza. To make a change, press the space bar. Press the down arrow to move to the next stanza or press CLEAR to leave the edit mode. To edit a stanza, use the right and left arrow keys to move the cursor that appears in the edit mode. To insert a character, place the cursor above the character that will follow the inserted one, then type the insertion. To delete a character, place the cursor above the one to be removed and press CLEAR. Press ENTER when you have completed your changes. If you make an incorrect change, *Song Writer* will not permit you to leave the edit mode until your error is corrected. Note: Although volume is not entered in the main screen you may edit volume into a stanza. The format for volume is `Vx`, where `x` is a value from 1 to 31.
- Play song — simply plays the song that you have typed in.
- New song — initializes all values and erases any current song in memory. You will be asked if you are sure — choose Y or N.
- Save song — saves the current song and all values under the filename `SONG`. When the recorder prompt is displayed, prepare the recorder and press ENTER.
- Load song — loads a previously saved song using the filename `SONG`. Any song in memory will be overwritten and all values changed to that of the new song.
- Return — takes program execution back to the main screen. Use this after you have completed using a sub-menu function.

When you have finished, press the SHIFT and CLEAR keys. *Song Writer* will ask if you want to quit; respond with Y or N.

Program Design

Song Writer was designed using a modular concept. That is, each function is a small subroutine of the larger program. Table 2 gives the line numbers for and a description of each module. I have included an abundance of remarks in the program to aid you in deciphering the logic flow. Due to the modular construction, changes could be made rather easily.

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Line Number	Description
50-60	Introductory screen and melody.
100-130	Program initialization.
500	Set initial play values.
510-550	Set up main screen.
1000-1050	Input main screen command and branch.
1100-1120	O.K. to end?
1130-1160	Check main screen input for invalid characters.
1170	Toggle on/off learn mode.
1180-1200	Set up sub-menu, input command and branch.
1210-1390, 1500-1580	Edit subroutines.
2000	Increase octave.
2010-2020	Decrease octave.
2030	Place item into song if learn mode is on.
2040	Increase note length.
2050-2060	Decrease note length.
2070	Rest.
2080-2090	Change tempo.
3000	Change stanza.
3010-3040	Display help screen.

Table 2: Subroutine Locations

A$	Various uses — string manipulation.
C$	String of spaces to clear display areas.
CC	Lenth of song "learned."
CP	Cursor position in edit mode.
D$	String of spaces to clear stanza area.
E	ASCII value of E$.
E$	Input variable (INKEY$ function).
FG$	Valid/invalid character flag when in edit mode. 0 = invalid, 1 = valid.
FL$	Learn flag. 0 = OFF, 1 = ON.
H$	PLAY function header, i.e., octave is 0.
ITM$	Function value (octave, tempo, etc.) to place into song.
L	High value of function (octave, tempo, etc.)
N	Number of stanzas.
N$	Notes to be placed into song.
NL	Note length value.
NV$	Valid/not valid character input.
OCT	Octave value.
P$	Opening melody.
S	Stanza displayed during edit mode.
S$	Song strings.
TP$	Tempo value.
V$	Notes which may be sharp.
X,Y	Loop and miscellaneous variables.

Table 3: Variable List

Variables are defined in Table 3. You will note that some variables are used for different purposes and serve no single function.

(Questions or comments concerning this program may be directed to the author at 521 Annex Ave., Kannapolis, NC 28081. Please enclose an SASE when requesting a reply.) ☐

500	89	1420	216
550	184	1540	26
1160	92	2010	203
1240	215	2090	180
1339	249	END	235

The listing: SONGWRTR

```
10 '*****************************
20 '******* SONG WRITER *******
30 '**** BY GARRY L SHELTON ***
40 '******* MARCH 1986 ********
49 '*** INTRODUCTORY SCREEN ***
50 CLS:PRINT@33,STRING$(30,214);
:PRINT@449,STRING$(30,214);:FORX
=65TO417STEP32:PRINT@X,CHR$(214)
;:PRINT@X+29,CHR$(214);:NEXTX:PR
INT@138,"song writer";:PRINT@206
,"by";:PRINT@264,"garry l shelto
n";
60 P$="O2;L4;T3;GGAL3;F+;L16;GL4
;ABBO3;CO2;L3;BL16;AL4GAGF+L2;G"
:PLAYP$
99 '*** PROGRAM INITIALIZATION *
**
100 POKE65495,0:CLEAR5000:DIMK$(
12),N$(21),S$(25):FORX=1TO12:REA
DK$(X):NEXTX:FORX=1TO21:READN$(X
):NEXTX:FORX=1TO7:READV$(X):NEXT
X:C$=STRING$(12,32):D$=STRING$(9
0,32)
110 DATA Z,S,X,D,C,V,G,B,H,N,J,M
120 DATA C,C+,D,D+,E,F,F+,G,G+,A
,A+,B,94,10,8,9,32,12,64,45,95
130 DATA C,D,F,G,A,E,B
499 '*** SET INITIAL "PLAY" VALU
ES ***
500 OCT=2:NL=4:TP$="2":N=1:NV$="
0":FL$="0"
509 '*** SET UP MAIN SCREEN ***
510 CLS:PRINT@0,"SONG:";:PRINT@9
6,"OCTAVE:";:PRINT@108,"NOTE LEN
GTH:";:PRINT@128,"LEARN MODE:":P
RINT@160,"STANZA NUMBER:":PRINT@
179,"TEMPO:":FORX=16TO27:FORY=10
TO51:SET(Y,X,5):NEXTY:FORY=15TO4
5STEP6:RESET(Y,X):NEXTY,X
520 FORX=16TO21:FORY=14TO20STEP6
:RESET(Y,X):RESET(Y+2,X):NEXTY:F
ORY=32TO44STEP6:RESET(Y,X):RESET
(Y+2,X):NEXTY,X:PRINT@192,STRING
$(32,230);:PRINT@327,"s";:PRINT@
330,"d";:PRINT@336,"g";:PRINT@33
9,"h";:PRINT@342,"j";:PRINT@422,
"z";:PRINT@425,"x";
530 PRINT@428,"c";:PRINT@431,"v"
;:PRINT@434,"b";:PRINT@437,"n";:
PRINT@440,"m";
540 PRINT@6,D$;:PRINT@6,S$(N);:P
RINT@103,"   ";:PRINT@103,OCT;:P
RINT@120,"   ";:PRINT@120,NL;:PR
INT@145,C$;:PRINT@175,"   ";:PRI
NT@175,N;:PRINT@186,"   ";:PRIN
T@186,TP$;:IFFL$="1" THENPRINT@1
40,"ON ";ELSEPRINT@140,"OFF";
550 PLAY"O"+STR$(OCT)+";"+"L"+ST
R$(NL)+";"+"T"+TP$
999 '*** INPUT A COMMAND ***
1000 E$=INKEY$:IFE$="" THEN1000E
LSEE=ASC(E$)
1010 IFE=92 THEN1100ELSEGOSUB113
0:IFNV$="0" THEN1000ELSENV$="0"
1020 IFE=64 THENGOSUB1170:GOTO10
00
1030 IFE=12 THEN1180ELSEIFE=94 T
HEN2000ELSEIFE=10THEN2010ELSEIFE
=8 THEN2040ELSEIFE=9 THEN2050ELS
EIFE=32 THEN2070ELSEIFE=45 THENT
P$="":GOTO2080ELSEIFE=95 THEN301
0
1040 IFFL$="1" THENS$(N)=S$(N)+E
$:PRINT@6,S$(N);:IFLEN(S$(N))>80
 THENGOSUB3000
1050 POKE65494,0:PLAYE$:POKE6549
5,0:GOTO1000
1099 '*** END ***
1100 PRINT@145,"end? y/n";
1110 E$=INKEY$:IFE$="" THEN1110E
LSEIFE$="Y" THENPOKE65494,0:END
1120 PRINT@145,C$;:GOTO1000
1129 '*** CHECK FOR VALID CHARAC
TER ***
1130 FORX=1TO12:IFE$=K$(X) THENE
$=N$(X):X=12:NV$="1"
1140 NEXTX:IFNV$="1" THENRETURN
1150 FORX=13TO21:IFE=VAL(N$(X))
THENX=21:NV$="1"
1160 NEXTX:RETURN
1169 '*** CHANGE LEARN FLAG ***
1170 IFFL$="1" THENFL$="0":PRINT
@140,"OFF";:RETURNELSEFL$="1":PR
INT@140,"ON ";:RETURN
1179 '*** SET UP SUB-MENU ***
1180 PRINT@145,"e p n s l r ";
1190 E$=INKEY$:IFE$="" THEN1190E
LSEIFE$="P" THEN1400ELSEIFE$="E"
 THEN1210ELSEIFE$="N"THEN1410ELS
EIFE$="S"THEN1440ELSEIFE$="L"THE
N1460ELSEIFE$="R" THENPRINT@145,
C$;:GOTO1000
1200 GOTO1190
1209 '*** EDIT SONG ***
1210 CLS:S=1:CP=1:PRINT@296,"EDI
T COMMANDS":PRINT@36,"STANZA: ";
S:PRINT@56,"edit":PRINT@320,"cle
ar TO QUIT   space TO EDIT":PRI
NT@352,"UP ARROW - DISPLAY PREV.
 STANZA.":PRINT@384,"DN ARROW -
DISPLAY NEXT STANZA.":GOSUB1260
1220 E$=INKEY$:IFE$="" THEN1220E
LSEE=ASC(E$)
1230 IFE=10 THEN1240ELSEIFE=94 T
HEN1250ELSEIFE=32 THENPRINT@448,
STRING$(20,32);:GOTO1270ELSEIFE=
12 THEN510ELSE1220
1239 '*** NEXT STANZA ***
1240 IFS<N THENS=S+1:GOSUB1260:G
OTO1220ELSE1220
1249 '*** PREVIOUS STANZA ***
1250 IF S>1 THENS=S-1:GOSUB1260:
GOTO1220ELSE1220
1259 '*** DISPLAY STANZA ***
1260 PRINT@44,S;:CC=LEN(S$(S)):P
RINT@96,D$;:PRINT@96,S$(S);:RETU
RN
1269 '*** EDIT STANZA ***
1270 A$=MID$(S$(S),CP,1):E$=INKE
Y$:PRINT@95+CP,CHR$(191);:PRINT@
95+CP,CHR$(191);:PRINT@95+CP,A$;
:IFE$="" THEN1270ELSEE=ASC(E$)
1280 IFE=8 THEN1320ELSEIFE=9 THE
N1330ELSEIFE=12 THEN1340ELSEIFE=
```

"I cannot imagine the CoCo 3 without ADOS-3; it would not be a complete machine."
The RAINBOW, July 1987

You've moved up to a CoCo 3. A powerful new machine. Now, it's time to give BASIC a shot in the arm, with ADOS-3. Wouldn't it be nice to turn on your machine and be greeted by an 80-column display, in the colors of your choice, with your own custom startup message? To run routinely at 2 MHz (double speed) without having to slow down for disk and printer operations? This and much, much more is possible with ADOS-3, our CoCo 3 adaptation of the acclaimed original ADOS, which shares the original's virtual 100% compatibility with commercial software. After customizing ADOS-3 using the provided configuring utility, you can have it burned into an EPROM that plugs into the Disk BASIC ROM socket, or just use it in RAM as a disk utility. (EPROM + burning will cost $15-20; we provide information concerning how you can have this done.) Supports double-sided drives (35, 40, or 80 tracks). FAST and SLOW commands, auto line number prompts, RUNM command, keystroke macros, arrow-key scroll through BASIC programs, auto-edit of error line, and many more valuable features.

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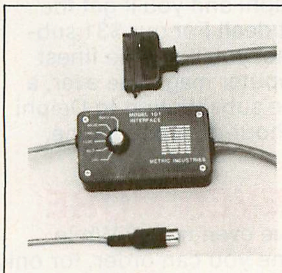
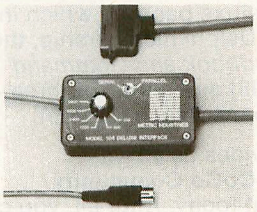
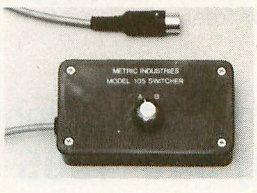
```
13 THEN1370
1289 '*** PLACE INPUT CHAR. INTO
 STANZA ***
1290 IF CC>=90 THENSOUND5,5:GOTO
1270
1300 IFCP=1 THENS$(S)=E$+S$(S) E
LSES$(S)=LEFT$(S$(S),CP-1)+E$+RI
GHT$(S$(S),CC-(CP-1))
1310 PRINT@96,S$(S);:CC=CC+1:CP=
CP+1:GOTO1270
1319 '*** MOVE EDIT CURSOR LEFT
***
1320 IFCP=1 THEN1270ELSECP=CP-1:
GOTO1270
1329 '*** MOVE EDIT CURSOR RIGHT
 ***
1330 IFCP=CC THEN1270ELSECP=CP+1
:GOTO1270
1339 '*** DELETE CHAR ***
1340 IFCC<=1 THENSOUND5,5:GOTO12
70
1350 IFCP=1 THENS$(S)=RIGHT$(S$(
S),CC-1) ELSEIFCP=CC THENS$(S)=L
EFT$(S$(S),CC-1) ELSES$(S)=LEFT$
(S$(S),CP-1)+RIGHT$(S$(S),CC-CP)
1360 PRINT@96,D$;:PRINT@96,S$(S)
;:IFCP=CC THENCP=CP-1:CC=CC-1:GO
TO1270ELSECC=CC-1:GOTO1270
1369 '*** CHECK FOR VALID EDIT C
HARS ***
1370 CP=1:Y=LEN(S$(S)):FG$="0"
1380 IFCP>Y THENPRINT@448,STRING
$(20,32);:PRINT@448,"edit comple
te";:CP=1:GOTO1220ELSEE$=MID$(S$
(S),CP,1)
1390 GOTO1500
1399 '*** PLAY THE SONG ***
1400 POKE65494,0:PLAY"O2;L4;T2;V
15":FORX=1TO N:PRINT@6,D$;:PRINT
@6,S$(X);:PRINT@175,X;:PLAYS$(X)
:NEXTX:POKE65495,0:GOTO1190
1409 '*** NEW SONG? ***
1410 PRINT@145,"new song? yn";
1420 E$=INKEY$:IFE$="" THEN1420E
LSEIFE$="Y" THENFORX=1TO N:S$(X)
="":NEXT:OCT=2:NL=4:TP$="2":N=1:
NV$="0":FL$="0":GOTO540
1430 GOTO1180
1439 '*** SAVE "SONG" ***
1440 POKE65494,0:PRINT@145,"reco
rder      ";:IFINKEY$="" THEN1440
1450 OPEN"O",#-1,"SONG":PRINT#-1
,OCT,NL,TP$:FORX=1TO N:PRINT#-1,
S$(X):NEXT:CLOSE:POKE65495,0:GOT
O1180
1459 '*** LOAD "SONG" ***
1460 POKE65494,0:PRINT@145,"reco
rder      ";:IFINKEY$="" THEN1460
1470 N=0:OPEN"I",#-1,"SONG":INPU
T#-1,OCT,NL,TP$
1480 IFEOF(-1) THENCLOSE:FL$="0"
:NV$="0":POKE65495,0:GOTO540
1490 N=N+1:INPUT#-1,S$(N):GOTO14
80
1499 '*** EDIT SUBROUTINE ***
1500 L=255:IFE$="T" OR E$="P" OR
E$="L" THEN1570ELSEIFE$="O" THEN
L=5:GOTO1570ELSEIFE$="V" THENL=3
1:GOTO1570
1509 '*** CHECK FOR CORRECT NOTE
S ***
1510 FORX=1TO7:IFE$=V$(X) THENX=
7:FG$="1"
1520 NEXTX:IFFG$="1" THEN1560
1530 IFE$="+" THEN1540 ELSEPRINT
@448,STRING$(20,32);:PRINT@448,"
invalid note";:SOUND5,5:GOTO1270
1539 '*** CHECK FOR CORRECT SHAR
PS ***
1540 FORX=1TO5:IFMID$(S$(S),CP-1
,1)=V$(X) THENFG$="1":X=5
1550 NEXTX:IFFG$="1" THEN1560ELS
EPRINT@448,STRING$(20,32);:PRINT
@448,"invalid use of sharp";:SOU
ND5,5:GOTO1270
1559 '*** UP CURS POS. BY ONE -
CONTINUE EDIT ***
1560 FG$="0":CP=CP+1:GOTO1380
1569 '*** CHECK FOR CORRECT FORM
AT OF FUNCTIONS ***
1570 FORX=1TO L:A$=E$+RIGHT$(STR
$(X),LEN(STR$(X))-1)+";":PRINT@4
16,A$,E$;:IFA$=MID$(S$(S),CP,LEN
(A$)) THENX=255:FG$="1"
1580 NEXTX:IFFG$="1" THENCP=CP+L
EN(A$):FG$="0":GOTO1380 ELSEPRIN
T@448,STRING$(20,32);:PRINT@448,
"invalid format";:SOUND5,5:GOTO1
270
1999 '*** INCREASE OCTAVE ***
2000 IFOCT=5 THEN1000ELSEOCT=OCT
+1:GOTO2020
2009 '*** DECREASE OCTAVE ***
2010 IFOCT=1 THEN1000ELSEOCT=OCT
-1
2020 ITM$=RIGHT$(STR$(OCT),1):PL
AY"O"+ITM$:PRINT@103,OCT;:H$="O"
:IFFL$="1" THENGOSUB2030:GOTO100
0ELSE1000
2029 '*** PLACE INTO SONG IF FLA
G IS SET ***
2030 S$(N)=S$(N)+H$+ITM$+";":PRI
NT@6,S$(N);:IFLEN(S$(N))>80 THEN
GOSUB3000:RETURNELSERETURN
2039 '*** INCREASE NOTE LENGTH *
**
2040 IFNL=1 THEN1000ELSEIFNL<8 T
HENNL=NL-1:GOTO2060ELSENL=NL/2:G
```

```
OTO2060
2049 '*** DECREASE NOTE LENGTH *
**
2050 IFNL=64 THEN1000ELSEIFNL>3
THENNL=NL*2 ELSENL=NL+1
2060 ITM$=RIGHT$(STR$(NL),LEN(ST
R$(NL))-1):PLAY"L"+ITM$:PRINT@12
0,NL;:H$="L":IFFL$="1" THENGOSUB
2030:GOTO1000ELSE1000
2069 '*** REST ***
2070 IFFL$="0" THEN1000ELSEH$="P
":ITM$=RIGHT$(STR$(NL),LEN(STR$(
NL))-1):GOSUB2030:IFLEN(S$(N))>8
0 THENGOSUB3000:GOTO1000ELSE1000
2079 '*** CHANGE TEMPO ***
2080 E$=INKEY$:IFE$=""THEN2080 E
LSEIFASC(E$)=13 THEN2090ELSEIFAS
C(E$)=8 THENTP$=LEFT$(TP$,LEN(TP
$)-1):PRINT@186,"    ";:PRINT@18
6,TP$;:GOTO2080ELSETP$=TP$+E$:PR
INT@186,"    ";:PRINT@186,TP$;:G
OTO2080
2090 IFVAL(TP$)<1 OR VAL(TP$)>25
5 THENSOUND5,5:GOTO2080ELSEPLAY"
T"+TP$:IFFL$="1" THENITM$=TP$:H$
="T":GOSUB2030:GOTO1000ELSE1000
2999 '*** CHANGE STANZA ***
3000 N=N+1:PRINT@6,D$;:PRINT@175
,N;:RETURN
3009 '*** HELP SCREEN ***
3010 CLS:PRINT@0,"***** SONG WRI
TER COMMANDS *****";:PRINT"UP AR
ROW     INCREASE OCTAVE":PRINT"D
N ARROW     DECREASE OCTAVE":PRI
NT"<-           INCREASE NOTE":P
RINT"->           DECREASE NOTE"
:PRINT"SPACE BAR    REST"
3020 PRINT"-            CHANGE T
EMPO":PRINT"@             TOGGLE
ON/OFF LEARN";:PRINT"SHIFT CLEAR
 END PROGRAM":PRINT"CLEAR
 DISPLAY SUB-MENU":PRINT" eDIT
SONG     sAVE SONG":PRINT" pLAY
SONG     lOAD SONG":PRINT" nEW S
ONG      rETURN"
3030 PRINT:PRINT"SHIFT UP ARROW
 HELP SCREEN":PLAY"T2;O3;L8;CO2;
EEO3;CL2;CL8;CO2;EEO3;CCO2;EFEDD
DBL2;BL8;BDDBBDEDCCCAL2;AL8;ACCA
ACDCO1;BBBO2;G+L2;G+L8;G+ABFL1;E
":PRINT@484,"press any key to re
turn";:PRINT@0,;
3040 IFINKEY$="" THEN3040ELSE510
```







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- ★ Comes complete with cables to connect to your printer and computer
- ★ Can be powered by most printers

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- ★ **Same Features as 101 Plus**
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- ★ Switch between Serial Output and Parallel Output
- ★ Comes with cables to connect to your computer and printer
- ★ Can be powered by most printers

Model 105 Serial Switch

- ★ Connects to your COCO to give you 2 switch selectable Serial Ports
- ★ Comes with a 3 foot cable to connect to your computer
- ★ Now you can connect your Printer (or printer interface) and your Modem (or other serial device) to your COCO and flip the switch to use either device
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- ★ Program comes with 24 labels to get you started
- ★ 16K ECB required

Some of the Printers That Can –
Supply power for the 101 and 104 are Radio Shack, Star, Okidata, Brother, Juki, and Smith Corona.

Some of the Printers That Cannot –
Supply power for the interfaces are Epson, Seikosha, Panasonic, Silver Reed and NEC. If your printer cannot supply power to the interface you can order your interface with the "P" option or you can supply your own AC adapter. We recommend the Radio Shack 273-1431 AC adapter with a 274-328 connector adapter.

Write or call for more information or for technical assistance.

Price List

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Model 105	14.95
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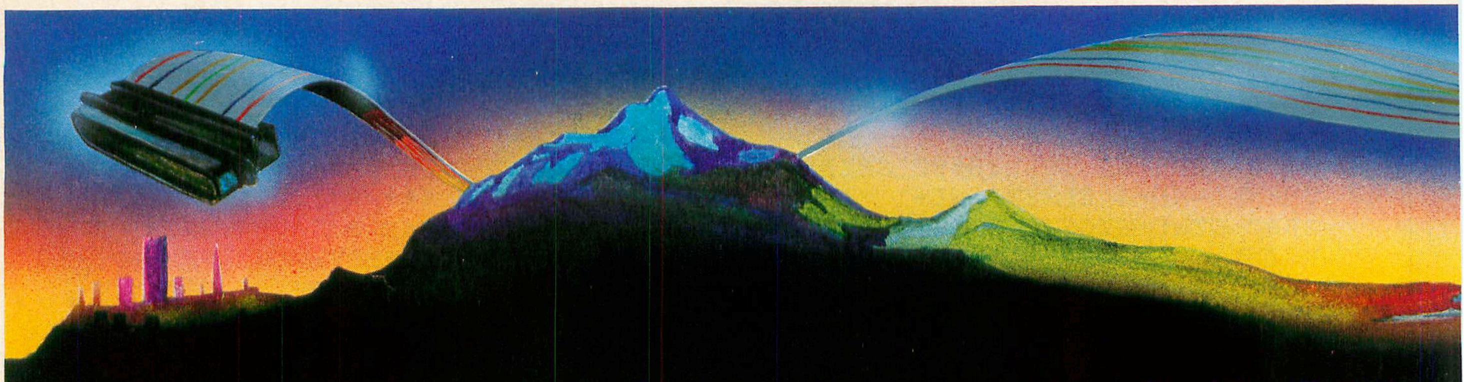

WE'RE BRINGING THE COCO

RAINBOW'S BROADENING ITS SPECTRUM

THE RAINBOW and the Delphi Information Utility have joined together to allow CoCo owners all over the world to connect with one another!

Delphi is a full-service information utility. It offers everything from up-to-the-minute news stories from The Associated Press to electronic mail services. But, *best of all*, it now has **a special forum for Color Computer owners, and it's operated by the people who bring you THE RAINBOW each month.**

The CoCo Special Interest Group (SIG) features a variety of services, including an open forum where you can send and receive messages from Color Computer owners all over the world. It also has several databases to which you can upload your favorite programs and from which you can download programs written by other CoCo enthusiasts. Some of these databases are BASIC programming, OS-9 and home applications.

When setting up your account with Delphi, if you do not have a credit card or prefer not to use it, Delphi requires that you send $25 to give your account a positive balance. This will be refunded after your first free hour if you choose to no longer use the system or it will be applied to future connect charges. If you do not maintain a positive balance, you will be charged $3.50 each month for direct billing.

PEEK INTO THE RAINBOW

The CoCo SIG's conference feature allows you to meet electronically with other members of the CoCo Community. You can join conferences with notables such as Dale Puckett, Cray Augsburg, Marty Goodman, Don Hutchison, Jim Reed, Lonnie Falk and others — on a regular basis. Conference schedules will appear in THE RAINBOW each month. Be sure to check online announcements for changes and additions.

THE OTHER SIDE OF THE RAINBOW

On Delphi, you also are able to buy RAINBOW ON TAPE — order a whole set, or download an individual program immediately. You can also renew your RAINBOW subscription, make a fast and easy order for software or hardware from a multitude of vendors, or inquire about products on the CoCo SIG.

We also have a number of **programs that you can download** and use, just for the cost of the time you spend transferring them. There'll also be **corrections for RAINBOW articles,** helpful hints and many other useful features.

FREE LIFETIME MEMBERSHIP

THE RAINBOW is offering subscribers a free lifetime subscription to Delphi — a $24.95 value — and a free hour of connect time — a $7.20 value at either 300, 1200 or 2400 Baud — so you can sample Delphi and the RAINBOW CoCo SIG. That's right. Your subscription to THE RAINBOW entitles you to this $32.15 value as a ***free bonus!***

If you're not a RAINBOW subscriber, just enter your order when you sign on with Delphi and you'll get the same great deal! For our $31 subscription fee, you'll get the finest Color Computer magazine ever, a free lifetime subscription to Delphi and a free hour of connect time.

SAVE EVEN MORE

Want to save even more? While you're online you can order, for only $29.95, a deluxe package which includes the Delphi membership, the *Delphi Handbook and Command Card* ($21.95) and a total of three hours of connect time ($21.60).

Delphi provides us all with **Immediate CoCo Community**. Check it out today. After all, you can sample it for free!

Problems? Call Delphi:

(800) 544-4005

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DELPHI TYPE:
GROUP COCO

COMMUNITY TOGETHER

How to reach RAINBOW's Color Computer SIG . . .

There are several ways to connect to Delphi and THE RAINBOW's CoCo SIG. In most cities you will not even have to pay long distance charges; you can use special data communications networks like Telenet, Tymnet and the Canadian Datapac network.

First, set your terminal program to operate at either 300 or 1200 Baud (depending on the modem you have), and also select either 7 bits with even parity or 8 bits with no parity, and one stop bit. (If one combination doesn't work, try another.)

Decide which network you should use. There is no surcharge for Telenet or Tymnet. Canadian residents using Datapac will be charged an additional $10.80 (U.S.) per hour.

On Telenet: Uninet network has merged with Telenet. To get the Telenet number for your area, call (800) 336-0437. After you call the local access number and make connection, press ENTER twice. When the "TERMINAL=" prompt appears, press ENTER again. When the "@" prompt appears, type `C DELPHI` and press ENTER.

On Tymnet: Call (800) 336-0149 to get the Tymnet number for your area. After you dial your designated number and connect, you will see either "garbage" or a message saying "please type your terminal identifier." At this point, even if the screen is garbled, simply press 'A'. When "please log in:" appears, type `DELPHI` and press ENTER.

From Canada (on Datapac): Call Delphi Customer Service at (617) 491-3393 to get the Datapac number for your area. After you connect, press the period key (.) and ENTER (use two periods if you're using 1200 Baud). Type `SET 2:1, 3:126` and press ENTER. Now type `p 1 3106, DELPHI;` and press ENTER. Delphi's new rates indicate an additional $10.80 hourly surcharge for evening use of Datapac, which means a total of $18 (U.S.) for connect time.

From other countries: Many countries have their own data networks that can connect to either Telenet or Tymnet. Check with the telephone authorities in your country for details on how to sign up for this service. When you have an account set up, you can reach Delphi with a "host code" of 3110 6170 3088 through Telenet, or 3106 90 6015 through Tymnet. (You'll have to pay the toll charges for this connection.)

Type in Your Username

If you're already a subscriber to THE RAINBOW, at the "USERNAME:" prompt, type `JOINDELPHI` and press ENTER. At the "PASSWORD:" prompt, type `RAINBOW`. Then, at the "NUMBER:" prompt, type your individual subscription number from the mailing label of your latest issue of THE RAINBOW. (If there are one or more zeros at the beginning of this number, include them.)

If you don't already have a subscription, at the "USERNAME:" prompt, type `JOINDELPHI` and press ENTER. At the "PASSWORD:" prompt, type `SENDRAINBOW` and press ENTER. Have your MasterCard, VISA or American Express card ready, because you'll be led through a series of questions that will enable us to put your RAINBOW and Delphi subscriptions into effect. In an effort to hold down non-editorial costs, we do not bill for subscriptions.

If you make a typing error, just use Control-X and start over. Remember that at any point, when you're on Delphi, you can type `HELP` to get help on how to use the system. To get off the system just type `BYE`.

If you find that you're unable to log on to Delphi and enter the CoCo SIG after following these instructions, call us during afternoon business hours at (502) 228-4492. We'll be glad to offer assistance.

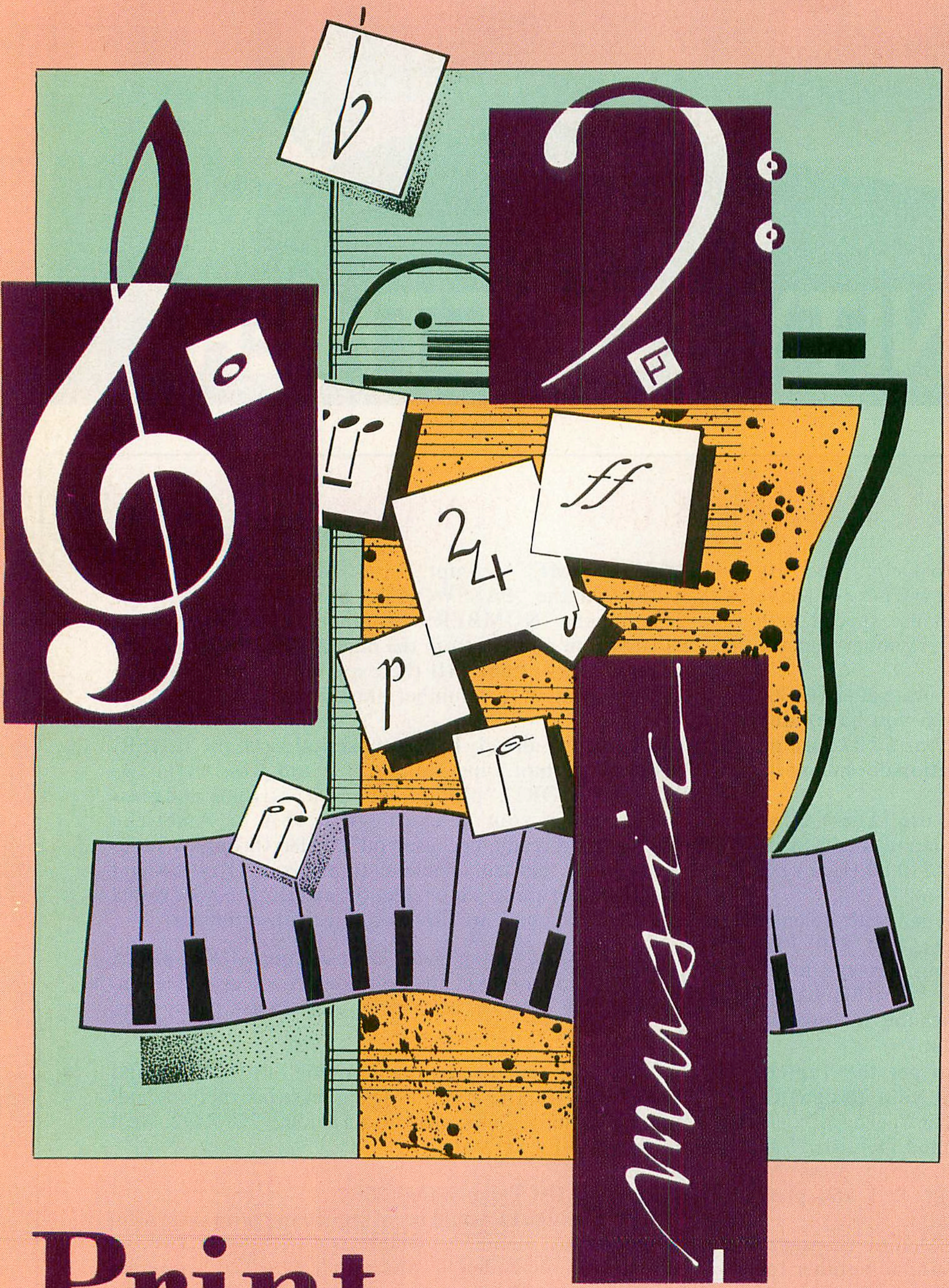
Come Visit Us! Type: `GROUP COCO`

After you sign in, you'll be prompted to set up your own, personal "user name" — Delphi is a friendly service, no numbers to remember — and you'll be asked a number of questions so Delphi can set up your account. You'll also be assigned a temporary password.

Delphi will tell you that your account will be ready after 6 p.m. the same day if you sign up before noon (Eastern time zone.) If not, your account will be ready at 6 p.m. the next day. Once an account is verified and opened, *each RAINBOW subscriber will be credited with an hour of free time!*

When you log back in, use your chosen username and your temporary password to access the system. At that point, you will meet Max, who will help you configure things and will change your temporary password into your own *personal* password. This is the password you will use for subsequent sessions — or until you change it.

After Max bids you goodbye, you'll wind up at the Delphi Main Menu; type in `GROUP COCO` and **join us on the CoCo SIG!**



Turn your keyboard into more than a piano

Print That Tune!

By Greg Boots

Want to use the advantages of the Extended BASIC PLAY command to put a tune into a program, but not sure how to get the numbers? *Print Tune* turns the keyboard into more than a piano. With the aid of the Radio Shack disk drive and a TP-10 printer, you can print the complete PLAY statement for that tune by simply pressing a key. Type in and save *Print Tune.* Run the program and you are prompted with the main menu.

Notice that you are at Sound #1. Turn up the TV volume and press one of the top row of 12 keys (1-across), being careful not to press BREAK. The key pressed represents a note and is printed on the menu with a corresponding sound. The top row keys are the complete octave; there are five octaves selected by pressing the up or down arrow key. Press one of the note keys and adjust the octave to hear the desired

---

Greg Boots, an electronic engineering technician for a small accoustic emission-testing company, is a self-taught programmer who owns two CoCos.

note. The length of the note can be made shorter (=1) or longer (=255) by pressing the left or right arrow key. Pressing X changes the amount incremented (1 or 10). After choosing a note, press ENTER to store that note in memory.

Now the screen shows that you are at the next sound. Press the space bar, and the note that had been entered is played. Once a few notes have been entered and you press the space bar, you will hear a string of sounds that may sound a little funny. In most cases some editing will have to be done. To edit a note you must single-step to the sound you want to edit by pressing S and enter the starting sound number (e.g., #1 — Sound #1 or the beginning of the tune).

If you enter nothing or a letter or incorrect number, the program will return to the main menu. In the single-step mode the lower portion of the screen gives you a new menu of options, takes you to the starting sound number and plays the sound. At this point press P to repeat the sound for further investigation, or continue single-stepping. You can single-step through each sound to the end of the tune, although you will have to enter a new starting number.

At any point up to the last sound entered, you can go back to the starting sound by pressing R. You can loop through a section of the tune to look for the sound you want to edit by single-stepping through the tune and returning to the starting sound.

There are two ways out of the single-step mode: single-stepping or editing. When you find the sound you want to edit, press E. The menu is changed, and the numbers for that particular sound are placed on the screen. At this point you have to know what you want to change; for example, the Pause Length, which is the length of the pause after the sound, is determined by pressing the SHIFT and left or right arrow key (1=longest, 255=shortest).

Sound volume is adjusted by the SHIFT up or down arrow key (1=quiet, 31=loud). Pressing the space bar plays the tune up to the editing sound. You have the option to change any or none of the numbers in the editing sound. Once you press ENTER, the numbers, changed or not, are placed back into that particular sound in memory. Edit is a fast way out of the single-step mode, press E and ENTER, returning to the main menu for options.

Press the space bar to be sure your tune is safely stored. You can save it on disk by pressing $. The disk drive comes to life as CoCo looks at the directory, prints the name of the tunes on file and prompts you to enter a filename for the tune. Enter the name of the tune in eight letters or less. (Entering nothing returns you to the main menu.) Once entered, the tune is stored on disk, and you are returned to the main menu.

To enter a new tune, BREAK the program and run. Now you are at Sound #1. Breaking the program is not necessary when loading a new tune from disk. To load a tune into memory from disk, press & and the directory is read; the tunes on file are printed, prompting you to enter the tune desired.

After lengthening or editing, press ?; the tune you have made can be printed as a `PLAY` statement that can be used in a BASIC program. If the `PLAY` statement is greater than 255 bytes, consecutive statements are printed. The pause length will be shorter (divide 13.4) on the printout due to the computer time required for playing the tune while pressing the space bar.

Except during input/output or playing the tune, the program uses the "fast BASIC" (`POKE 65495,0`) to give the keyboard better response. For those of you who can't use it, delete the pokes in lines 770 and 780. Also, the printout is written for normal BASIC. If you save a tune on disk using the name of one already on file, the new tune will write over the old one. The new tune should be equal in length or longer than the old one, or they will mix.

Keep the program and tunes together on a separate (formatted) disk, because the program will see other data files. Each sound uses five bytes of memory and the program presently allows for 200 sounds. This can be changed by altering the `DIM` statement on Line 10. Line 110 will change both 996s to whatever `DIM-9` is in the program.

(Questions or comments concerning this program may be directed to the author at 1438 Thayer Dr., Richland, WA 99352. Please enclose an SASE when requesting a reply.) ☐

160	218
310	251
370	36
460	60
580	53
680	251
END	134

The listing: PRINTUNE

```
5 '"PRINTUNE"
6 'WRITTEN BY GREG BOOTS
10 GOSUB770:CLEAR1300:DIMDAT(100
5):DAT=1:PLAY"T2"
15 '**BASIC VARIABLES**
20 A=1:B=30:C=31:D=1:E=255:X=10:
S=0
25 '**MAIN MENU**
30 CLS:PRINT@33,"NOTE=1 ACROSS T
O 12"
40 PRINT" OCTAVE=UP OR DOWN"
50 PRINT" LENGTH=LEFT OR RIGHT"
60 PRINT" PAUSE LENGTH=^ (L)OR(R
)"
70 PRINT" VOLUME=^ UP OR DOWN"
80 PRINT@1,"X="X
90 GOSUB770:PRINT@7,"SOUND#"INT(
DAT/5)+1
100 IFED=0 THENPRINT@193,"PRESS
<S> TO SINGLE STEP":PRINT" <SPAC
EBAR> PLAYS TUNE":PRINT" <ENTER>
 KEEPS SOUND#"INT(DAT/5)+1:PRINT
"   <$> TO SAVE TUNE":PRINT"   <
&> TO LOAD A TUNE":PRINT"   <?>
TO PRINT TUNE"
110 IFDAT=996THENPRINT@19,"*LAST
 SOUND*"ELSEIFDAT>996THENS=1
120 PRINT@58,D
```

```
130 PRINT@90,A
140 PRINT@122,B
150 PRINT@154,E
160 PRINT@186,C
165 '**KEYBOARD INPUT**
170 A$=INKEY$:IFA$=""THEN170ELSE
NUM=VAL(A$)
180 IFNUM>=1ANDNUM<10THEND=NUM:G
OTO400
190 IFA$="0"THEND=10:GOTO400
200 IFA$=":"THEND=11:GOTO400
210 IFA$="-"THEND=12:GOTO400
220 IFA$="^"ANDA<5THENA=A+1:GOTO
130
230 IFA$=CHR$(10)ANDA>1THENA=A-1
:GOTO130
240 IFA$=CHR$(9)ANDB<256-X THENB
=B+X:GOTO140
250 IFA$=CHR$(8)ANDB>0+X THENB=B
-X:GOTO140
260 IFA$=CHR$(93)ANDE<256-X THEN
E=E+X:GOTO150
270 IFA$=CHR$(21)ANDE>0+X THENE=
E-X:GOTO150
280 IFA$=CHR$(95)ANDC<32-X THENC
=C+X:GOTO160
290 IFA$=CHR$(91)ANDC>0+X THENC=
C-X:GOTO160
300 IFA$="X"THENIFX=1THENX=10:GO
TO80
310 IFA$="X"THENIFX=10THENX=1:GO
TO80
320 IFA$=CHR$(32)THENFORPL=1 TOD
AT STEP5:IFPL=DAT THEN90ELSEPRIN
T@13,INT(PL/5)+1:GOSUB780:PLAY"O
"+STR$(DAT(PL))+";L"+STR$(DAT(PL
+1))+";V"+STR$(DAT(PL+2))+";"+ST
R$(DAT(PL+3))+";P"+STR$(DAT(PL+4
)):NEXTPL
330 IFA$=CHR$(13)ANDED=1 THENED=
0:DAT(DAT)=A:DAT(DAT+1)=B:DAT(DA
T+2)=C:DAT(DAT+3)=D:DAT(DAT+4)=E
:DAT=PAT:A=DAT(DAT):B=DAT(DAT+1)
:C=DAT(DAT+2):D=DAT(DAT+3):E=DAT
(DAT+4):GOTO20
340 IFA$=CHR$(13)ANDS=0 THENDAT(
DAT)=A:DAT(DAT+1)=B:DAT(DAT+2)=C
:DAT(DAT+3)=D:DAD(DAT+4)=E:DAT=D
AT+5
350 IFA$="S"ANDED=0 THENPRINT@22
5:PRINTTAB(120):PRINT@191:INPUT"
 ENTER STARTING SOUND# ";I$:I=VA
L(I$):IFI=0ORI>(DAT/5)+1 THEN90E
LSEI=I-1:I=(I*5)+1:PRINT@193,"PR
ESS *S* TO SINGLE STEP":PRINT@22
5:GOTO410
360 IFA$=CHR$(36)ANDED=0ANDPL>1
THENPRINTTAB(183):PRINT@256:GOSU
B590:PRINT" TO SAVE TUNE ENTER":
LINEINPUT" LESS THAN 9 LETTERS:
";ND$:IFND$="" THEN30ELSE490
370 IFA$=CHR$(38)ANDED=0 THENPRI
NTTAB(183):PRINT@225:GOSUB590:LI
NEINPUT" ENTER NAME OF TUNE: ";N
D$:IFND$=""THEN30ELSE540
380 IFA$=CHR$(63)ANDED=0ANDPL>1T
HEN650
390 GOTO80
395 '**KEYBOARD NOTE**
400 GOSUB780:PLAY"O"+STR$(A)+";L
"+STR$(B)+";V"+STR$(C)+";"+STR$(
D)+";P"+STR$(E):GOSUB770:GOTO90
405 '**SPACEBAR PLAY**
410 FORPL=I TODAT STEP5:IFPL=DAT
 THEN90ELSEPRINT@13,INT(PL/5)+1:
GOSUB780:PLAY"O"+STR$(DAT(PL))+"
;L"+STR$(DAT(PL+1))+";V"+STR$(DA
T(PL+2))+";"+STR$(DAT(PL+3))+";P
"+STR$(DAT(PL+4)):GOSUB770
415 '**SINGLE STEP ROUTINE**
420 A$=INKEY$:PRINT@225,"PRESS *
E* TO EDIT SOUND":PRINT" PRESS *
P* TO REPEAT SOUND":PRINT" PRESS
 *R* RETURN TO START SOUND":IFA$
=""THEN420
430 IFA$="S"THEN NEXTPL
440 IFA$="E"THEN480
450 IFA$="R"THEN410
460 IFA$="P"THENGOSUB780:PLAY"O"
+STR$(DAT(PL))+";L"+STR$(DAT(PL+
1))+";V"+STR$(DAT(PL+2))+";"+STR
$(DAT(PL+3))+";P"+STR$(DAT(PL+4)
):GOSUB770
470 GOTO420
475 '**EDIT ROUTINE**
480 PRINT@193,"*EDIT* PRESS ENTE
R TO KEEP":PRINT:PRINT:PRINT:ED=
1:PAT=DAT:DAT=PL:A=DAT(PL):B=DAT
(PL+1):C=DAT(PL+2):D=DAT(PL+3):E
=DAT(PL+4):GOTO90
485 '**DISC SAVE ROUTINE**
490 IFLEN(ND$)>8 THENCLS:GOTO360
495 GOSUB780:OPEN"D",#1,ND$,25
500 FIELD#1,5 AS A$,5 AS B$,5 AS
 C$,5 AS D$,5 AS E$
510 FOROD=1 TODAT STEP5
520 LSETA$=MKN$(DAT(OD)):LSETB$=
MKN$(DAT(OD+1)):LSETC$=MKN$(DAT(
OD+2)):LSETD$=MKN$(DAT(OD+3)):LS
ETE$=MKN$(DAT(OD+4))
530 PUT#1,INT((OD/5)+1):NEXTOD:C
LOSE#1:PRINT" **"ND$"** IS SAVED
:":FORT=1TO1500:NEXTT:GOSUB770:C
LS:GOTO20
535 '**DISC LOAD ROUTINE**
540 GOSUB790:GOSUB780:OPEN"D",#1
,ND$,25
550 FIELD#1,5 AS A$,5 AS B$,5 AS
 C$,5 AS D$,5 AS E$
560 FORDAT=1TOLOF(1)-1:GET#1,DAT
570 DAT(DAT*5-4)=CVN(A$):DAT(DAT
*5-3)=CVN(B$):DAT(DAT*5-2)=CVN(C
$):DAT(DAT*5-1)=CVN(D$):DAT(DAT*
5)=CVN(E$)
```

```
580 NEXTDAT:DAT=DAT*5-4:CLOSE#1:
GOSUB770:CLS:GOTO20
585 '**DISC DIRECTORY SUB**
590 PRINT" TUNES ON FILE:":FORSE
C=3TO11
600 GOSUB780:DSKI$0,17,SEC,L$,R$
:GOSUB770
610 DI$=L$+LEFT$(R$,127)
620 FORT=0TO7
630 IFMID$(DI$,T*32+9,3)="DAT"AN
DMID$(DI$,T*32+1,1)<>CHR$(0) THE
NPRINT" "MID$(DI$,T*32+1,8)
640 NEXTT:NEXTSEC:DI$="":L$="":R
$="":RETURN
645 '**PRINTER ROUTINE**
650 PRINTTAB(180):PRINT@225:LINE
INPUT" NAME OF TUNE: ";N$:IFN$="
"THEN30ELSEGOSUB780:PRINT#-2,N$:
GOSUB770:T=0:S$="PLAY"+CHR$(34)+
"T2;":FORP=1TODAT-1 STEP5
660 A=DAT(P):B=DAT(P+1):C=DAT(P+
2):D=DAT(P+3):E=INT(DAT(P+4)/13.
4+1)
670 IFA<>AA THENS$=S$+"O"+RIGHT$
(STR$(A),LEN(STR$(A))-1):AA=A:GO
SUB740
680 IFB<>BB THENS$=S$+"L"+RIGHT$
(STR$(B),LEN(STR$(B))-1):BB=B:GO
SUB740
690 IFC<>CC THENS$=S$+"V"+RIGHT$
(STR$(C),LEN(STR$(C))-1):CC=C:GO
SUB740
700 S$=S$+RIGHT$(STR$(D),LEN(STR
$(D))-1):GOSUB740
710 S$=S$+"P"+RIGHT$(STR$(E),LEN
(STR$(E))-1)
720 IFP=DAT-5 THENT=1
730 GOSUB740:NEXTP:AA=0:BB=0:CC=
0:S$="":GOTO20
740 IFLEN(S$)<242ANDT=0 THENS$=S
$+";":RETURN
750 IFLEN(S$)>=242 OR T=1 THENS$
=S$+CHR$(34):GOSUB780:PRINT#-2,S
$:GOSUB770:S$=LEFT$(S$,5):T=0
760 RETURN
765 '**KEYBOARD RESPONSE POKES**
770 POKE65495,0:RETURN
780 POKE65494,0:RETURN
785 'ERROR TRAP FOR LOADING TUNE
 NOT ON FILE
790 L=LEN(ND$):FORSEC=3TO11:GOSU
B780:DSKI$0,17,SEC,L$,R$:GOSUB77
0:DI$=L$+LEFT$(R$,127):FORT=0TO7
800 IFND$=MID$(DI$,T*32+1,L)ANDM
ID$(DI$,T*32+9,3)="DAT" THENRETU
RN
810 NEXTT:NEXTSEC:DI$="":L$="":R
$="":PRINT" **"ND$"**IS NOT ON F
ILE:":SOUND60,10:FORN=1TO500:NEX
TN:CLS:GOTO360
```

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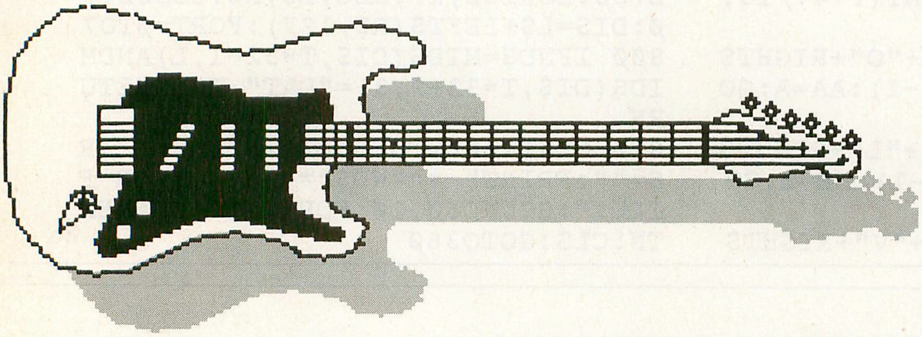
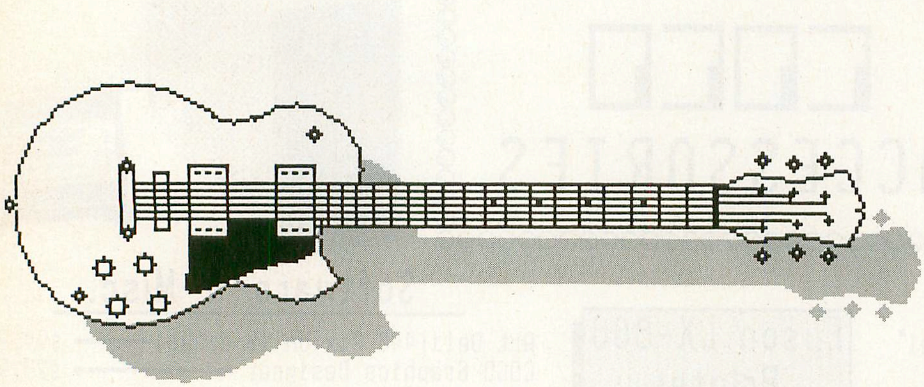
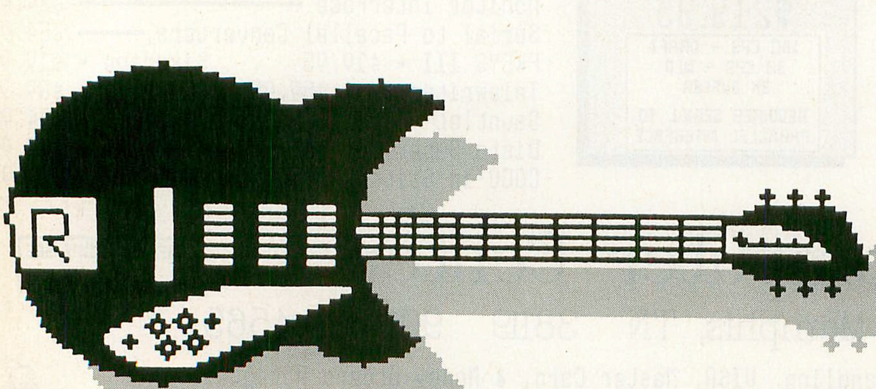
Calling all guitar buffs . . .

Graphing Great Guitars

By Bill Bernico







I started playing guitar the summer I turned 14 and The Beatles were at their height. Now, 23 years later, I'm still playing; I've owned or played almost every kind of guitar available to me at the time.

Now that my newfound interest is the computer, I decided to combine the two interests and present in graphics form three of my favorite guitars: The Rickenbacker Model 360, the Fender Stratocaster and the Gibson Les Paul. You can see these guitars one at a time by pressing any key as each is displayed. Three REM lines in the program show you where each guitar is drawn.

If you only want to draw the Fender, for example, enter lines 9 through 15; be sure to insert *before* Line 9 `PMODE 4,1:PCLS 1:SCREEN 1,1:COLOR 0,1` and `EXEC 44539` *after* Line 15 so that your picture will remain on the screen.

There must be other CoCo enthusiasts out there who were or still are guitar buffs. If so, I think you'll enjoy *Graphic Guitars*. The program is a teaching aid as well as an entertaining diversion. By dissecting the individual blocks of the program, you can see how things like knobs, strings, pick guards, and even the guitar's body shape were formed with the `DRAW`, `LINE`, `CIRCLE` and `PAINT` commands.

(Questions or comments regarding this program may be directed to the author at 709 Michigan Avenue, Sheboygan, WI 53081. Please enclose an SASE when requesting a response.) ☐

Bill Bernico is the author of over 200 Color Computer programs and is a frequent RAINBOW contributor whose hobbies include golf, writing music and programming. Bill is a drummer in a rock band and lives in Sheboygan, Wisconsin.

7	194
11	207
15	39
20	138
END	95

The listing: GUITARS

```
1 'GUITARS by Bill Bernico
2 'RICKENBACKER MODEL 360
3 PMODE4,1:PCLS1:SCREEN1,1:COLOR
0,1:DRAW"BM196,92S4L68D8R68U8R3E
RER14FRDFDFDFDFD2LGLGL16HLHLHLUR
15FR4UH4LHL3HL10":PAINT(216,92),
0:CIRCLE(214,88),1:CIRCLE(209,88
),1:CIRCLE(204,88),1:CIRCLE(206,
105),1:CIRCLE(211,105),1
4 CIRCLE(216,105),1:CIRCLE(153,9
5),25,0,1,.35,.70:CIRCLE(133,87)
,20,0,1,.68,.85:CIRCLE(130,105),
15,0,1,.13,.35:CIRCLE(94,94),30,
0,1,.15,.84:DRAW"BM110,69HF2RFRF
R3ERER2BD46BL2L6GLBM125,102U12L6
D12R6BL15U12R6D12L6BL10U12R6D12L
6BL5BD3U18L4D18R4BL14BU2
5 DRAW"U14L16R16D14L14BM126,105L
22GL2GL2GL2GL2GLGLGLGLGLD2F3RFRF
R10ERERERERERERERERERERERERERERE
UL":PAINT(85,85),0:DRAW"BM196,94
L100D2R100D2L100D2R30U8L30R37D8R
3U8R3D8R4U8R4D8R5U8R6D8R7U8R7D8R
8U8R8D8":CIRCLE(87,116),1:CIRCLE
(92,113),2
6 CIRCLE(94,117),2:CIRCLE(97,112
),2:CIRCLE(99,116),2:CIRCLE(102,
112),1:CIRCLE(199,96),1:DRAW"BM2
00,97S3R4NU2R4NU2R4NU2R4U2BM69,9
6S4D4U8R5FD3GL3F4BM5,32S8U12L2R7
FD4GL4F6NL9R4U6BU3UDBD3D6R4U6R5N
D2L5D6R5U
7 DRAW"DR4EDU12D8E4RDULG3F5L7R11
U2EHU2ER3FDUHL3GD2FR2L2GDFL5R12E
U6DER3FD6L9UDR4UDR9U12D12UFR6U5H
L2DFRDFRFRFL20R24LU5ER4FUD6L6R10
U6R5D2U2L5D6R5UDR4U12D8E4RDULG3F
5L7R11U2EHU2ER3FDUHL3GD2FR2BM199
,32R4NUR4U7DER3FDBD5L5R7
8 'FENDER STRATOCASTER
9 EXEC44539:PCLS:DRAW"BM104,95S4
;R100D10L100U10R7U4HU2HL2G":LINE
(106,88)-(100,89),PSET:LINE-(94,
89),PSET:DRAW"L4HLH":LINE(88,87)
-(80,85),PSET:LINE-(76,84),PSET:
DRAW"L2HL5GL2GLGLGDGD2R3D17L9U17
R6BD17D3GDGDGDGDGDGDFDFR3ER2ER
ERERERER2ERER2ER2ER4"
10 LINE(85,118)-(108,124),PSET:D
RAW"R5URUHL2HL2ULHLHLHUHUHU2EUEU
E2":CIRCLE(59,122),3:CIRCLE(64,1
16),3:DRAW"BM98,95D11GL2HU11ER2F
BL11D11GL2HU11ER2FD11BM77,95DGDG
DGDGDGDGL2HUEUEUEUEUEUER2F":CIRC
LE(117,111),8,0,1,.25,.65:CIRCLE
(109,110),19,0,1,.17,.33
11 CIRCLE(87,157),35,0,1,.65,.83
:DRAW"BM115,117;FRFRDRDGDGDL":CI
RCLE(53,109),24,0,1,.23,.5:DRAW"
BM65,130;LGLGL3BH29D5U18":CIRCLE
(53,89),24,0,1,.5,.73:DRAW"BM51,
66R3FR2FR2
12 CIRCLE(90,48),30,0,1,.18,.33:
DRAW"BM62,68;FRFRFRFRFRFR2":CIRC
LE(118,100),30,0,1,.68,.85:CIRCL
E(126,89),8,0,1,.4,.79:DRAW"BM12
8,82R2ERERU3":CIRCLE(49,115),4,0
,1,.6,.99:DRAW"BM46,114GDGDGD3E2
RE2RERER":CIRCLE(49,115),2
13 CIRCLE(49,115),1:PAINT(107,89
),0:DRAW"BM204,95;R2ERERERM243,1
02D2":CIRCLE(238,102),7,0,1,.1,.
4:DRAW"BM232,106;M214,110LULUHLH
LHL2":CIRCLE(216,90),2:CIRCLE(22
1,92),2:CIRCLE(226,94),2:CIRCLE(
231,95),2:CIRCLE(236,97),2:CIRCL
E(241,99),2
14 CIRCLE(214,96),1:CIRCLE(219,9
8),1:CIRCLE(224,99),1:CIRCLE(229
,101),1:CIRCLE(234,102),1:CIRCLE
```

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```
(239,104),1:DRAW"BM213,95L160D2N
R165D2NR171D2NR176D2NR181D2R186B
M196,95D10L8U10L8D10L8U10L7D10L7
U10L7D10L6U10L6D10L5U10L5D10L5U1
0L4D10L4U10LD10L3U10L3D10
15 DRAW"L3BM205,95D10BM184,100LB
L14LBL13LBL12LBL14LBM25,39S4U16H
LG4D2BF3E7BF4BDHL2GD2FR2L2GD2FR2
ERERU8DERERFD5FERU7ERERFU8D14UGL
GLGEREREFREU3ER2L2HU2ER2FHL2GD2F
GD2FR3EREREU7LDR2FRFD2FRE":EXEC4
4539:PCLS
16 'GIBSON LES PAUL
17 DRAW"BM45,28S4U6HLGLGLGLG2D25
RE2RERERE2U9D25U10E7U10BU15URDLB
D15D10RFRERE2U27D27R2ER2EREU10HL
GLRERFD9R2E2DU2R2FR2EREU2HL2HL2H
U2ERER2FRDU2D2ERERD7FRERERERU8BL3
BU2GLGLD2BF7U2ERERD2U12D2ERERERF
D19FRERBM105,60":CIRCLE(29,138),
3:CIRCLE(41,137),3
18 CIRCLE(33,149),3:CIRCLE(45,14
8),3:CIRCLE(22,146),2:CIRCLE(36,
128),2:CIRCLE(36,109),2:LINE(38,
109)-(38,128),PSET:LINE(34,109)-
(34,128),PSET:DRAW"BM44,111D16R4
U16L4BR10U2D20R11U20L11BR25D16NL
13D4R11U20L11
19 CIRCLE(90,100),2:DRAW"BM54,12
9D7M53,144FR2M70,140ERER2M81,136
R4EREREU7R115U12L115R115L8D12L8U
12L8D12L8U12L7D12L7U12L7D12L7U12
L6D12L6U12L6D12L5U12L5D12L5U12L5
D12L5U12L4D12L4U12L4D12U12R119ER
ERERM229,113M239,111ER3FDFDFDFDF
DGLRFDGDGDGDGDBM56,111
20 DRAW"RBR2RBR2RBR18RBR2RBR2RBM
56,127RBR2RBR2RBR18RBR2RBR2RBM24
3,131L3HL3HL4UL5DL6DL5H2LHLHL4BM
206,114D12":PAINT(56,131),0:CIRC
LE(219,107),2:CIRCLE(228,108),2:
CIRCLE(237,107),2:CIRCLE(219,134
),2:CIRCLE(229,133),2:CIRCLE(238
,134),2:CIRCLE(219,115),1
21 CIRCLE(228,116),1:CIRCLE(237,
117),1:CIRCLE(219,126),1:CIRCLE(
229,125),1:CIRCLE(238,124),1:CIR
CLE(37,120),35,0,1,.15,.86:CIRCL
E(67,86),11,0,1,.16,.39:CIRCLE(8
5,110),19,0,1,.65,.04:CIRCLE(69,
154),12,0,1,.63,.85:CIRCLE(85,13
0),18,0,1,.11,.33
22 CIRCLE(109,129),18,0,1,.39,.5
5:CIRCLE(1,120),2:DRAW"BM206,114
L168D2R168D2L168D2R168D2L168D2R1
68BM185,119LBL15LBL13LBL12LBM206
,115R12D2L12R21D2L21NR31D3NR31D2
NR21D2R12":EXEC44539:RUN
```

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By George Phillips

Your tank is your defense against bombs dropping from enemy planes. The planes' pilots do their best to hit you, but they sometimes collide with each other. The action is fast and often over before realizing what has happened. This is *Blitz*, an arcade game requiring 32K ECB for use on the Color Computer.

Loading *Blitz*

Blitz consists of three BASIC programs which combine to create a machine language program. The program in Listing 1 pokes in the actual machine language code, Listing 2 pokes in the data for the planes, bombs, explosions, etc. and Listing 3 saves the program to disk or tape and then runs *Blitz*.

Type in all three programs and save them before you run them. Now run the programs in order. Listing 1 will take some time to run, as will Listing 2, but you can see what is happening — the graphics characters for the tank, planes, bombs and explosions are drawn on the screen as they are created. Should any of the programs give you an error, fix any typos, save the program and start over. Once you have made as many copies of *Blitz* as you need, you can run the program by typing `CLOADM"BLITZ"` (or `LOADM"BLITZ"` if you have a disk) and then typing `EXEC`.

George Phillips is currently finishing his master's degree in computer science at the University of British Columbia and believes it is easier to write programs in assembly language than in BASIC.

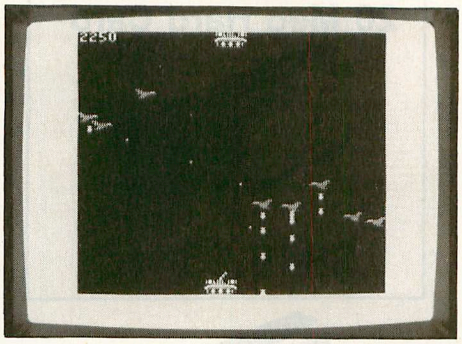
Troubleshooting

I have tried to make the program easy to enter and modify.

The program in Listing 1 is the most important, since it pokes in the code for *Blitz*. The code is stored as data lines, with each line having at its end a checksum that is the sum of all the data bytes. Should the sum of the data bytes not equal the checksum, the program will show a checksum error for that line. This means that either the data is incorrect or the checksum is incorrect. In any case, check the line and make the necessary changes to correct the error.

The line checksum should cover almost any typing errors you may make, but an overall checksum is provided as an extra check. It is the sum of all the data bytes, line checksums and data preceded by asterisks. If you get no line checksum errors, yet the overall checksum is incorrect, check the overall checksum itself and the asterisk data. If those are correct, check for line duplication. If that is not the problem, you have no choice but to review all the data. It is probable that you will never have to resort to the last step.

Listing 2 is a lot less important to *Blitz*'s operation. It pokes in the shapes, so all you have to do is be careful in making the shapes the correct size; do not add any dots or lines.



Listing 3 is a nice short one; it simply pokes in a little machine language routine to move *Blitz* to the proper place in memory and then saves it to disk or tape. Make sure that you get that machine language program typed in correctly.

Game Play

If you have managed to get *Blitz* typed in, loaded and executed, you're ready to play the game! Select the level of play by pressing a number from 0 to 9. Level 0 is the easiest, Level 9 the hardest. After you have pressed a number, the game starts. Your tank falls from your reserve at the top of the screen, and once it has bounced to a stop, the enemy attack begins in earnest. When the game is over (or you have no more tanks or are frustrated), press BREAK to get back to the title page and start another game.

The controls consist of the left arrow, right arrow and F key. The F key fires your bullets (hold it down for rapid fire). The arrow keys move your tank's barrel; but when the barrel can no longer move left or right, your tank will move instead. Although this method may seem strange, it works better than a five-key system. To pause during the game, press P; use the R key to resume play.

How hard the enemy attacks is based on the level of play. At level 0 bombs are not even dropped, but on Level 9 many planes, dropping multiple bombs, are launched. Enemy planes are of four varieties: Non-bombers, single bombers, constant bombers and stick bombers. They all travel at three different speeds, so the only way to tell them apart is to see what they do as they fly over. The non-bombers are harmless. The single-bombers drop one bomb.

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Reviewed in RAINBOW, February 1988.

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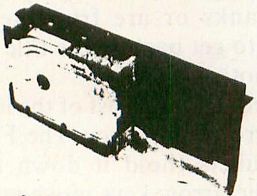

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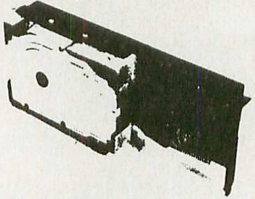

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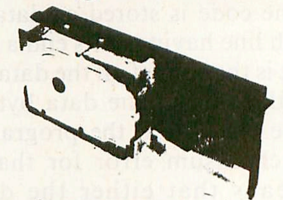

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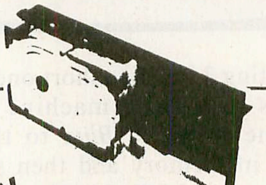

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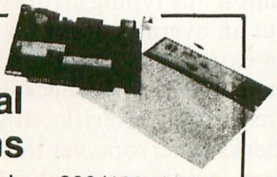

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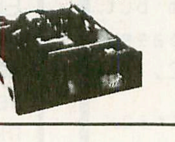

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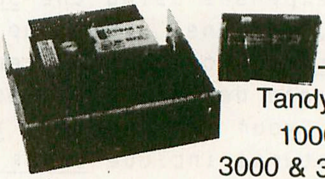

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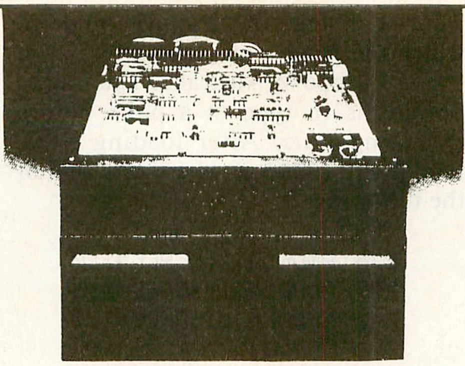

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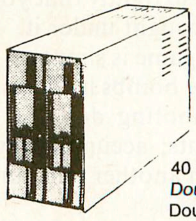

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The constant bombers drop bombs at regularly spaced intervals; your tank may be able to go between them. The stick bombers drop a "stick" of five bombs spaced so tightly that you will be hit if you are caught under it.

Playing the game is simple: Shoot the planes (and the bombs if necessary) and stay alive. Shooting down a plane is worth 75 points; accumulating 10,000 points gets you another tank and moves you up a level.

Modifications

You can easily make some very simple modifications to *Blitz*. You can change the shapes of the places and tanks by drawing in new ones in Listing 2. Just make sure that you do not draw outside the border of dots for each shape. I suggest you use my shapes first, but changing them (i.e., making the tank smaller) could make the game easier.

Since *Blitz* defaults to artifacting (`PMODE4,1:SCREEN1,1`), you might want to change the graphics mode in which the game runs, especially if you live in Europe or Australia. The way to do this is to type in a poke before executing *Blitz*. After loading *Blitz*, type `POKE 16399,`*x* where *x* is one of the following:

```
224 PMODE3,1:SCREEN1,0
232 PMODE4,1:SCREEN1,1
240 PMODE4,1:SCREEN1,0
```

Hints

Blitz can be tough to play, so here are a few hints to help you along. Do not waste too much time shooting the bombs; they are hard to hit and pose no danger if you aren't sitting directly below. When a bomb is dropped, decide whether to shoot or move; both are possible, but you have to move quickly.

The bombs are aimed when the planes come onto the screen, so if you move after they are shown on the screen, your tank will be safe (unless the plane is a constant bomber). And keep moving, the bombers will have a harder time hitting you. Be aware, however, on the higher levels the planes appear so often that one or two will be able to "target" your location.

One last trick is to create a "cloud." Since your bullets explode on contact, you can form a "cloud" of explosions above your tank by holding down the fire key (F). You now have a bit of cover which can be held over your tank even while moving left (or right, but it's harder). To let the cloud fade away, relinquish the fire key. You can use this "cloud" to great advantage, especially at the higher levels; while you are safe, the planes can collide with each other and score points for you.

(Questions or comments regarding this program may be directed to the author at RR#1, Creston, British Columbia, V0B 1G0. Please enclose an SASE when requesting a reply.) ☐

116	198	354	79
142	186	382	93
174	119	415	32
202	149	442	68
234	143	474	185
262	164	502	8
293	178	527	244
322	170	END	27

Listing 1: `BLITZ1`

```
10 CLEAR200,23199:P=32768:L=99:B
=0
20 L=L+1:READA$:IFA$="END"THENIF
B<>401940THENCLS4:PRINT"OVERALL
CHECKSUM IS INCORRECT-- DATA BAD
!!":ENDELSECLS5:PRINT"OK, NOW RU
N PROGRAM 2":END
30 IFASC(A$)=42THENP=VAL("&H"+MI
D$(A$,2)):B=B+P:GOTO20
50 C=0:FORN=0TO5:V=VAL("&H"+A$):
C=C+V:POKEP+N,V:READA$:NEXT:P=P+
6:CK=VAL("&H"+A$):B=B+CK:IFC=CK
THEN20
60 CLS4:PRINT"CHECKSUM ERROR IN"
L:PRINT"VALUE "HEX$(C)" SHOULD B
E "A$:STOP
100 DATA *6EE0
101 DATA B7,FF,C5,B7,FF,C3,4F4
102 DATA B7,FF,C0,B6,FF,22,44D
103 DATA 84,7,8A,F8,B7,FF,3C3
104 DATA 22,8E,FF,D2,10,BE,34F
105 DATA 41,52,C6,7,4F,78,227
106 DATA 41,52,49,A7,86,30,239
107 DATA 1E,5A,26,F4,10,BF,261
108 DATA 41,52,39,BE,41,50,21B
109 DATA 10,8E,18,0,6F,80,1A5
110 DATA 31,3F,26,FA,39,34,1FD
111 DATA 76,8D,61,7F,41,4F,273
112 DATA F6,41,48,A6,80,A4,349
113 DATA C0,BA,41,4F,B7,41,302
114 DATA 4F,5A,26,F3,F6,41,2F9
115 DATA 4C,3A,F6,41,4D,33,23D
116 DATA C5,7A,41,49,26,E2,2D1
117 DATA 7D,41,4F,35,F6,34,26C
118 DATA 76,8D,37,10,BE,41,249
119 DATA A5,B6,41,A3,C6,4,309
120 DATA 3D,31,AB,AF,A1,B6,31F
121 DATA 41,49,A7,A0,B6,41,2C8
122 DATA 48,A7,A4,7C,41,A3,2F3
123 DATA F6,41,48,A6,84,AA,353
124 DATA C0,A7,80,5A,26,F7,35E
125 DATA F6,41,4C,3A,F6,41,2F4
126 DATA 4D,33,C5,7A,41,49,249
127 DATA 26,E6,35,F6,7F,41,2F7
128 DATA 4D,BE,41,50,FD,41,2DA
129 DATA 4A,EC,C1,FD,41,46,37B
130 DATA FD,41,48,B6,41,4A,2C7
131 DATA 81,7F,23,26,7F,41,209
132 DATA 4E,5F,44,56,44,59,1E4
133 DATA 59,B6,41,4A,40,4A,224
134 DATA 44,44,4C,B1,41,46,20C
135 DATA 24,72,33,C6,B7,41,287
136 DATA 4D,B6,41,46,B0,41,27B
137 DATA 4D,B7,41,48,20,1F,1CC
138 DATA 5F,44,56,44,59,59,1EF
139 DATA B7,41,4E,86,20,B0,29C
140 DATA 41,4E,B1,41,46,24,1EB
141 DATA C,B7,41,48,B6,41,243
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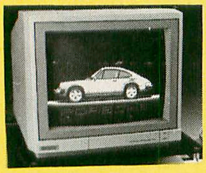

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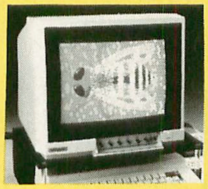

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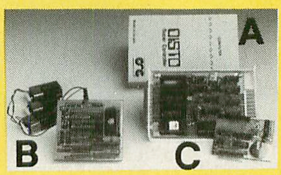

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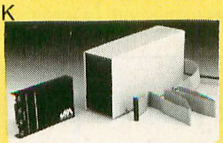

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142 DATA 46,B0,41,48,B7,41,277
143 DATA 4D,B6,41,46,3D,B6,27D
144 DATA 41,47,3D,33,CB,F6,2B9
145 DATA 41,4E,3A,86,20,B0,21F
146 DATA 41,48,B7,41,4C,B6,283
147 DATA 41,4B,81,BF,23,13,202
148 DATA BB,41,47,2F,21,B7,24A
149 DATA 41,49,F6,41,46,B6,2BD
150 DATA 41,4B,40,3D,33,CB,207
151 DATA 39,C6,20,3D,30,8B,217
152 DATA 86,C0,B0,41,4B,B1,333
153 DATA 41,47,24,3,B7,41,1A7
154 DATA 49,39,35,10,1A,4,E5
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158 DATA 0,B6,41,50,F6,41,27E
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160 DATA 50,BE,41,A5,10,BE,2C2
161 DATA 41,A7,BF,41,A7,10,29F
162 DATA BF,41,A5,B6,41,A3,33F
163 DATA F6,41,A4,B7,41,A4,377
164 DATA F7,41,A3,39,7D,41,2D2
165 DATA A3,27,1F,FE,41,A5,2CD
166 DATA AE,C1,A6,C0,E6,C4,47F
167 DATA 34,10,6F,80,5A,26,1B3
168 DATA FB,35,10,30,88,20,218
169 DATA 4A,26,EF,33,41,7A,24D
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171 DATA 0,41,A9,43,A9,41,217
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175 DATA A6,A4,81,7,22,13,207
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177 DATA EE,C6,EC,A1,17,FA,452
178 DATA 9D,7A,41,54,26,E8,2BA
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181 DATA 20,1,B6,20,0,C6,1BD
182 DATA 3,3D,33,CB,C6,3,207
183 DATA A6,C0,A7,A0,5A,26,32D
184 DATA F9,31,3D,20,D8,48,2A7
185 DATA 18,46,86,47,C,47,17E
186 DATA 92,48,18,48,9E,49,221
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192 DATA FF,40,10,CE,30,0,24D
193 DATA 8E,10,0,10,8E,F,14B
194 DATA 0,6F,80,31,3F,26,185
195 DATA FA,8E,50,0,CE,4E,2F4
196 DATA 0,10,8E,2,0,A6,146
197 DATA C0,A7,89,18,0,A7,2AF
198 DATA 80,31,3F,26,F4,17,221
199 DATA F,C2,B6,FF,22,84,32C
200 DATA 7,B7,FF,22,7F,FF,35D
201 DATA C4,7F,FF,C2,7F,FF,482
202 DATA C0,10,8E,2,0,8E,1EE
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204 DATA 2A,4,8B,10,8A,80,1D3
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206 DATA 2A,4,8B,10,8A,80,1D3
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208 DATA C6,C8,5A,27,D8,AD,394
209 DATA 9F,A0,0,27,F7,81,2DE
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211 DATA EF,80,2F,B7,32,53,2DA
212 DATA 81,6,25,3,B7,32,198
213 DATA 54,17,F,99,17,F,139
214 DATA 69,17,10,BD,17,F,173
215 DATA 90,7F,41,A3,7F,20,292
216 DATA 0,7F,24,0,7F,22,144
217 DATA 0,7F,2D,FF,86,38,269
218 DATA B7,2D,FC,86,6,B7,323
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221 DATA FE,86,38,B7,34,E9,390
222 DATA 7F,34,EA,7F,4B,0,267
223 DATA 7F,4B,1,7F,4B,2,197
224 DATA 7F,4B,3,17,14,D1,1C9
225 DATA 7D,2D,FF,2B,5,27,200
226 DATA 3,17,6,28,B6,20,11E
227 DATA 0,34,2,B6,26,0,112
228 DATA 34,2,17,4,11,35,97
229 DATA 2,8E,10,0,B1,26,177
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231 DATA BF,32,55,17,1A,53,1CA
232 DATA 17,1,54,17,4,D3,15A
233 DATA 17,19,FA,17,3,BB,1FF
234 DATA 17,2,76,35,2,CE,194
235 DATA 10,0,B1,20,0,24,105
236 DATA 3,CE,A0,0,CC,FB,338
237 DATA 40,B7,FF,2,F4,FF,3EB
238 DATA 0,10,27,FE,D8,CC,2D9
239 DATA FE,4,B7,FF,2,F4,3AE
240 DATA FF,0,26,B,CC,FB,2F7
241 DATA 4,B7,FF,2,F4,FF,3AF
242 DATA 0,26,F5,B6,FF,1,2D1
243 DATA 84,F7,B7,FF,1,B6,3E8
244 DATA FF,3,84,F7,B7,FF,433
245 DATA 3,B6,FF,23,8A,8,26D
246 DATA B7,FF,23,10,8E,0,277
247 DATA 28,BE,32,55,A6,80,293
248 DATA B7,FF,20,C6,17,C5,378
249 DATA 7,26,5,A6,C0,B7,24F
250 DATA FF,20,5A,26,F4,31,2C4
251 DATA 3F,26,E9,86,1,B7,28C
252 DATA 32,4E,7D,32,4E,26,1A3
253 DATA FB,17,F,FA,B6,22,2F3
254 DATA 0,BA,2D,FF,BA,20,2C0
255 DATA 0,BA,24,0,BA,26,1BE
256 DATA 0,10,26,FF,3E,7D,1F0
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258 DATA 7A,2D,FE,86,38,B7,31A
259 DATA 2D,FC,86,6,B7,2D,299
260 DATA FD,7A,2D,FF,7F,32,354
261 DATA 4F,7F,32,50,7F,32,201
262 DATA 51,7F,32,52,86,46,220
263 DATA B7,34,E9,17,19,43,247
264 DATA 17,3,4,B6,34,E9,1F1
265 DATA 81,38,27,3,7A,34,191
266 DATA E9,FC,32,4F,C3,0,329
267 DATA 80,FD,32,4F,F3,32,323
268 DATA 51,FD,32,51,7D,32,280
269 DATA 4F,2B,21,81,B5,23,1F4
270 DATA 1D,86,B5,B7,32,51,292
271 DATA 74,32,4F,76,32,50,1ED
272 DATA 7D,32,4F,10,27,FE,233
273 DATA DC,FC,32,4F,43,53,2EF
274 DATA C3,0,1,FD,32,4F,242
275 DATA B6,2D,FC,F6,32,51,358
276 DATA CE,2B,C0,17,E,55,233
277 DATA C0,6,CE,2D,6,17,1DE
278 DATA E,4D,86,1,B7,32,1CB
279 DATA 4E,7D,32,4E,26,FB,26C
280 DATA 17,F,59,20,98,B6,1ED
281 DATA FF,3,2A,20,B6,FF,301
282 DATA 2,7D,32,4D,27,5,12A
283 DATA 7A,32,4D,20,13,7D,1A9
284 DATA 32,4E,27,E,7F,32,166
285 DATA 4E,86,3,B7,32,4D,20D
286 DATA 17,F,E,17,D,B4,10C
287 DATA 3B,0,0,0,0,0,3B
288 DATA 0,0,0,0,0,35,35
289 DATA 86,B6,24,0,27,67,1EE
290 DATA B7,41,54,10,8E,24,20E
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291 DATA 1,CE,32,E8,EC,A4,379
292 DATA 17,D,CE,26,23,6A,1A5
293 DATA 23,26,A,A6,24,A7,1C4
294 DATA 23,A6,A4,AB,25,A7,2E4
295 DATA A4,EC,26,E3,21,ED,3A7
296 DATA 21,EC,26,C3,0,80,276
297 DATA ED,26,A6,21,81,BF,31A
298 DATA 22,36,20,1A,CE,20,180
299 DATA 1,B6,20,0,C6,3,1A0
300 DATA 3D,33,CB,6F,C0,EC,356
301 DATA A4,80,3,C0,3,ED,2D7
302 DATA C4,7C,20,0,20,1A,19A
303 DATA EC,A4,CE,32,E8,17,38F
304 DATA D,87,26,DC,EC,A4,326
305 DATA CE,32,E8,17,D,A7,2B3
306 DATA 31,28,7A,41,54,26,18E
307 DATA A0,39,7A,24,0,B6,22D
308 DATA 41,54,81,1,27,F5,233
309 DATA CE,24,1,B6,24,0,1CD
310 DATA C6,8,3D,33,CB,C6,2CF
311 DATA 8,A6,C0,A7,A0,5A,30F
312 DATA 26,F9,31,38,20,D8,280
313 DATA 2,5,F0,0,60,0,157
314 DATA F0,0,F0,0,60,0,240
315 DATA 3C,0,18,0,3C,0,90
316 DATA 3C,0,18,0,F,0,63
317 DATA 6,0,F,0,F,0,24
318 DATA 6,0,3,C0,1,80,14A
319 DATA 3,C0,3,C0,1,80,207
320 DATA CC,1B,C,FD,33,7A,29D
321 DATA CC,B1,75,FD,33,7C,39E
322 DATA 86,4,B7,41,55,10,1E7
323 DATA 8E,33,81,F6,41,55,2CE
324 DATA CE,3B,0,8E,33,76,240
325 DATA 3A,F7,41,54,7F,33,278
326 DATA 83,A6,C2,E6,A4,3D,3B2
327 DATA F3,33,82,E7,82,B7,3C8
328 DATA 33,83,7A,41,54,26,1EB
329 DATA EE,F6,41,55,CE,33,37B
330 DATA 76,8E,33,7A,33,C5,2A9
331 DATA 3A,1C,FE,A6,C2,A9,365
332 DATA 82,A7,84,5A,26,F7,324
333 DATA 31,3F,7A,41,55,26,1A6
334 DATA C0,FC,33,7A,84,7F,36C
335 DATA FD,3A,FC,FC,33,7C,3DE
336 DATA FD,3A,FE,39,0,0,26E
337 DATA 0,0,0,0,0,0,0
338 DATA 32,43,F6,AD,0,0,218
339 DATA 1,B,8,B6,4B,1,116
340 DATA B1,34,EA,27,17,B7,2C4
341 DATA 34,EA,7C,2D,FE,B6,37B
342 DATA 32,53,81,A,27,A,141
343 DATA 7C,32,53,81,6,26,1AE
344 DATA 3,B7,32,54,7D,2D,1EA
345 DATA FF,2A,8,7D,33,84,265
346 DATA 27,4,7A,33,84,39,195
347 DATA B6,33,85,B0,32,53,2A3
348 DATA B7,33,84,B6,32,53,2A9
349 DATA 8B,4,B7,33,86,17,216
350 DATA FF,4A,B6,3A,FF,84,3BC
351 DATA F,4C,B1,33,86,23,1E8
```

```
352 DATA 5,B0,33,86,20,F6,284
353 DATA B1,22,0,23,D6,B6,282
354 DATA 22,0,7C,22,0,C6,186
355 DATA 8,8E,22,1,3D,30,126
356 DATA 8B,B6,3A,FC,8B,A,30C
357 DATA A7,1,B6,3A,FF,84,31B
358 DATA 10,27,12,86,1,A7,177
359 DATA 4,86,F8,A7,84,B6,363
360 DATA 2D,FC,8B,9,B7,34,2A8
361 DATA AC,20,E,86,FF,A7,306
362 DATA 4,86,7F,A7,84,B0,2E4
363 DATA 2D,FC,B7,34,AC,B6,376
364 DATA 3A,FE,84,1,4C,A7,2B0
365 DATA 3,7D,32,54,27,8,135
366 DATA 6A,3,26,4,68,4,103
367 DATA 6C,3,A6,3,A7,2,1C1
368 DATA B6,32,53,4A,81,7,20D
369 DATA 23,2,86,7,CE,34,1B4
370 DATA 49,48,EE,C6,B6,3A,335
371 DATA FE,84,6,6E,D6,34,300
372 DATA 59,34,61,34,69,34,1BF
373 DATA 71,34,79,34,69,34,1EF
374 DATA 71,34,79,34,81,34,207
375 DATA 81,34,81,34,81,34,21F
376 DATA 81,34,81,34,84,34,222
377 DATA 84,34,81,34,81,34,222
378 DATA 84,34,8D,34,81,34,22E
379 DATA 84,34,8D,34,9D,34,24A
380 DATA 84,34,8D,34,9D,34,24A
381 DATA 9D,6F,7,39,8D,27,200
382 DATA E7,5,86,1,A7,7,221
383 DATA 39,B6,3A,FD,84,F,2B9
384 DATA 8B,19,A7,6,A7,7,1FF
385 DATA 86,1,A7,5,39,8D,1F9
386 DATA E,C0,12,E7,5,86,252
387 DATA 8,A7,6,86,5,A7,1E7
388 DATA 7,39,0,A6,1,80,167
389 DATA 7,CE,2E,0,A6,C6,26F
390 DATA E6,4,5D,2A,1,50,1C2
391 DATA 3D,A6,3,81,2,26,18F
392 DATA 1,54,50,FB,34,AC,280
393 DATA 39,B6,2D,FE,27,1A,25B
394 DATA 81,6,23,2,86,6,138
395 DATA B7,41,54,B6,34,E9,31F
396 DATA 5F,CE,2B,C0,17,B,23A
397 DATA 84,8B,E,7A,41,54,22C
398 DATA 26,F3,39,0,0,30,182
399 DATA *79E0
400 DATA 0,0,0,0,4,BE,C2
401 DATA 41,50,10,8E,4B,0,17A
402 DATA B6,4B,4,B7,41,54,251
403 DATA 7F,41,55,A6,A4,44,2A3
404 DATA 44,44,44,8D,14,A6,213
405 DATA A0,84,F,8D,E,7A,248
406 DATA 41,54,26,ED,7D,41,266
407 DATA 55,26,27,7C,41,55,1B4
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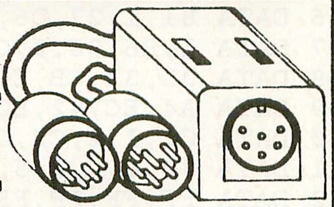

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409 DATA 55,27,1B,7C,41,55,1A9
410 DATA CE,4C,E7,C6,7,3D,30B
411 DATA 33,C5,C6,7,A6,C0,32B
412 DATA A7,84,30,88,20,5A,25D
413 DATA 26,F6,30,89,FF,21,2F5
414 DATA 39,B6,22,0,10,27,148
415 DATA 0,A7,B7,41,54,10,203
416 DATA 8E,22,1,6A,22,26,163
417 DATA 57,A6,23,A7,22,A6,28F
418 DATA A4,AB,24,A7,A4,81,33F
419 DATA 80,10,27,0,8D,81,1C5
420 DATA F7,10,27,0,87,6D,222
421 DATA 27,27,3D,A6,24,81,1D6
422 DATA FF,27,8,81,1,27,1D7
423 DATA 4,6A,25,27,4,6A,128
424 DATA 25,26,2B,A6,26,A7,1E9
425 DATA 25,6A,27,B6,24,0,190
426 DATA C6,8,3D,CE,24,1,1FE
427 DATA 33,CB,EC,A4,C3,4,355
428 DATA 7,A0,24,ED,C1,6F,2E8
429 DATA C0,EC,22,ED,C1,A6,422
430 DATA 24,A7,C0,6F,C0,6F,329
431 DATA C4,7C,24,0,EC,A4,2F4
432 DATA CE,4C,3B,6D,24,2A,210
433 DATA 3,CE,4C,91,34,40,222
434 DATA 17,F4,6C,27,22,CE,28E
435 DATA 20,1,B6,20,0,48,13F
436 DATA BB,20,0,33,C6,6F,243
437 DATA C0,EC,A4,ED,C4,7C,47D
438 DATA 20,0,35,40,CE,4B,1AE
439 DATA 0,8E,4C,26,17,0,117
440 DATA 39,20,11,35,40,EC,1CB
441 DATA A4,17,F4,6B,31,28,273
442 DATA 7A,41,54,10,26,FF,244
443 DATA 60,39,7A,22,0,B6,1EB
444 DATA 41,54,81,1,27,F5,233
445 DATA CE,22,1,B6,22,0,1C9
446 DATA C6,8,3D,33,CB,C6,2CF
447 DATA 8,A6,C0,A7,A0,5A,30F
448 DATA 26,F9,31,38,20,D6,27E
449 DATA 0,0,0,75,F6,4B,1B6
450 DATA 4,5A,1C,FE,A6,85,2A3
451 DATA A9,C5,19,A7,C5,5A,34D
452 DATA 2C,F6,39,3,7,A0,205
453 DATA *63E0
454 DATA 7D,2D,FF,10,2A,0,1E3
455 DATA AC,CC,DF,8,B7,FF,415
456 DATA 2,F4,FF,0,26,14,22F
457 DATA 7D,2D,FD,26,C,B6,28F
458 DATA 2D,FC,81,A,27,8,1E3
459 DATA 7A,2D,FC,20,3,7A,240
460 DATA 2D,FD,CC,BF,8,B7,374
461 DATA FF,2,F4,FF,0,26,31A
462 DATA 16,86,C,B1,2D,FD,283
463 DATA 26,C,86,65,B1,2D,1FB
464 DATA FC,27,8,7C,2D,FC,2D0
465 DATA 20,3,7C,2D,FD,C6,28F
466 DATA AF,CE,35,B4,B6,2D,349
467 DATA FD,48,EE,C6,B6,2D,3DC
468 DATA FC,17,B,D,C6,B5,2A6
```

```
469 DATA CE,2B,C0,17,A,DB,2B5
470 DATA 10,26,1,60,C6,B5,212
471 DATA CE,2B,C0,17,A,F9,2D3
472 DATA 7D,36,C3,27,4,7F,220
473 DATA 36,C3,39,B6,26,0,20E
474 DATA 81,A,27,37,CC,BF,274
475 DATA 1,B7,FF,2,F4,FF,3AC
476 DATA 0,26,2C,CE,26,1,147
477 DATA B6,26,0,48,48,33,19F
478 DATA C6,7C,26,0,B6,2D,24B
479 DATA FD,8E,35,CE,A6,86,3BA
480 DATA BB,2D,FC,C6,AD,ED,444
481 DATA C1,8E,36,5B,B6,2D,2C3
482 DATA FD,48,48,48,30,86,28B
483 DATA AF,C4,73,36,C3,39,318
484 DATA 2C,72,38,0,2C,BC,1BE
485 DATA 38,AC,3A,0,39,40,197
486 DATA 2D,6,39,8A,3A,4A,17A
487 DATA 38,F6,2D,50,38,4A,22D
488 DATA 2D,9A,1,2,3,4,D1
489 DATA 4,4,5,6,6,6,1F
490 DATA 7,8,9,B6,26,0,F4
491 DATA 27,37,B7,41,54,10,1BA
492 DATA 8E,26,1,86,8,B7,1FA
493 DATA 41,55,EC,A4,AE,22,2F6
494 DATA AB,80,5A,C1,9,27,276
495 DATA 3B,85,80,26,37,CE,26B
496 DATA 36,51,17,A,3A,26,108
497 DATA 15,7A,41,55,26,E8,233
498 DATA ED,A1,CE,36,51,17,2FA
499 DATA A,55,31,22,7A,41,16D
500 DATA 54,26,D0,39,80,5,208
501 DATA C0,5,34,6,CE,20,1ED
502 DATA 1,B6,20,0,C6,3,1A0
503 DATA 3D,33,CB,6F,C0,35,29F
504 DATA 6,ED,C4,7C,20,0,253
505 DATA 7A,26,0,B6,41,54,1EB
506 DATA 81,1,27,D6,CE,26,273
507 DATA 1,B6,26,0,C6,4,1A7
508 DATA 3D,33,CB,EC,C4,ED,3D8
509 DATA A4,EC,42,ED,22,20,301
510 DATA C1,1,2,C0,C0,30,274
511 DATA 30,C,C,3,3,FF,14D
512 DATA FF,FF,FF,FF,FF,FF,5FA
513 DATA FF,FF,0,FF,FF,FF,4FB
514 DATA 0,FF,FF,FF,0,FF,3FC
515 DATA 0,FF,0,FF,0,0,1FE
516 DATA 0,FF,0,0,FF,0,1FE
517 DATA FF,0,0,FF,0,0,1FE
518 DATA 0,FF,0,0,0,0,FF
519 DATA FF,0,0,0,0,0,FF
520 DATA 0,0,0,0,0,0,0
521 DATA 0,0,0,0,1,0,1
522 DATA 0,0,0,0,0,1,1
523 DATA 0,0,0,1,0,1,2
524 DATA 0,0,1,0,1,0,2
525 DATA 0,1,0,1,0,1,3
526 DATA 0,1,0,1,1,1,4
527 DATA 0,1,1,1,0,1,4
528 DATA 1,1,1,1,1,1,6
529 DATA 1,0,86,28,B7,41,1A7
```

```
530 DATA 56,B7,2D,FF,8E,28,2EF
531 DATA 0,34,10,17,F9,2C,180
532 DATA 35,10,B6,2D,FC,8B,2AF
533 DATA 5,5F,ED,81,CC,BF,35D
534 DATA 0,ED,81,FC,3A,FC,3A0
535 DATA C5,1,26,4,84,1,175
536 DATA 20,2,8A,FE,ED,81,318
537 DATA FC,3A,FE,84,7,34,2F3
538 DATA 2,64,E4,A9,E4,64,33B
539 DATA E4,AB,E0,43,ED,81,420
540 DATA 7A,41,56,26,C6,39,236
541 DATA 86,28,B7,41,54,7F,279
542 DATA 2D,FF,8E,28,0,E6,2C8
543 DATA 2,C1,BF,22,1E,EC,2AE
544 DATA 4,E3,84,ED,84,EC,3C8
545 DATA 6,C3,0,80,ED,6,23C
546 DATA E3,2,ED,2,A6,84,2FE
547 DATA E6,2,CE,36,51,17,254
548 DATA 9,2F,7C,2D,FF,30,210
549 DATA 8,7A,41,54,26,D5,212
550 DATA 39,2C,42,37,2C,32,13C
551 DATA END
```

230	74	2510	133
1010	75	2810	126
1320	86	3190	139
1610	164	3530	188
1920	61	END	130
2210	195		

Listing 2: BLITZ2

```
10 CLEAR200,23199:CLS:DIMG(100):
A=PEEK(186)*256+PEEK(187)
20 READP:IFP=0THEN210ELSEP=P+120
00
30 READW,H,F:PMODE4,1:PCLS0:SCRE
EN1,1:PMODE3,1:IFF=0THENPOKEP,W:
POKEP+1,H:P=P+2
40 FORY=0TOH-1:READA$:FORX=1TOLE
N(A$):PSET(X*2-2,Y,INSTR(".OBW",
MID$(A$,X,1))):NEXT:NEXT
50 GET(0,0)-(40,40),G,G:GOSUB90:
IFF THEN20ELSEPUT(2,0)-(42,40),G
,PSET:GOSUB90
60 PUT(4,0)-(44,40),G,PSET:GOSUB
90:PUT(6,0)-(46,40),G,PSET:GOSUB
90
70 GOTO20
90 FORY=0TOH-1:FORX=0TOW-1:POKEP
,PEEK(A+X+Y*32):P=P+1:NEXT:NEXT:
PMODE4,1:PCLS0:SCREEN1,1:PMODE3,
1:RETURN
200 PRINT@P+16-LEN(A$)/2,A$;:P=P
+32:RETURN
210 CLS0:C=2:FORX=0TO63:C=INT(X/
8)+1:SET(63-X,0,C):SET(63-X,4,C)
:SET(X,31,C):NEXT:FORY=1TO31:C=I
```

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ND THE":GOSUB200
260 A$="TANK TO SHOOT DOWN THE P
LANES.":GOSUB200:A$="PRESS 'F' T
O FIRE BULLETS":GOSUB200
270 A$="PRESS 'P' TO PAUSE THE G
AME,":GOSUB200:A$="'R' TO RESUME
 THE GAME,":GOSUB200:A$="BREAK T
O STOP THE GAME.":GOSUB200
280 A$="G O O D   L U C K !":GOS
UB200)
290 A$="(YOU'LL NEED IT!)":GOSUB
200
300 P=P+32:A$="STARTING LEVEL (0
-9)?":GOSUB200
310 A$="0 = EASY, 9 = HARD":GOSU
B200
320 FORN=1024TO1535:POKEN+30944,
PEEK(N):NEXT
330 P=23776:FORX=0TO191:POKEP+X,
INT(2*SQR(191-X)+.5):NEXT
340 CLS5:PRINT"OK, NOW RUN PROGR
AM 3."
1000 DATA 17920,3,11,0
1010 DATA ........
1020 DATA ........
1030 DATA ........
1040 DATA ........
1050 DATA ....W...
1060 DATA ...WWW..
1070 DATA ....W...
1080 DATA ........
1090 DATA ........
1100 DATA ........
1110 DATA ........
1120 DATA 18054,3,11,0
1130 DATA ........
1140 DATA ........
1150 DATA ........
1160 DATA ....W...
1170 DATA ...WWW..
1180 DATA ..WWWWW..
1190 DATA ...WWW...
1200 DATA ....W...
1210 DATA ........
1220 DATA ........
1230 DATA ........
1240 DATA 18188,3,11,0
1250 DATA ........
1260 DATA ........
1270 DATA ........
1280 DATA ...WWW...
1290 DATA ..WWWWWW..
```

NEW

New Features Added to Data Master!!

- **Data Merge capability** to interface with our OS-9 Text Formatter – perfect for using data master information imbedded in letters, forms, and more!
- **Expanded file list display** capabilities make it easier to scan through your data files.

Update for current users:

Data Master users can receive this new version by ordering "Data Master Update" for only $10. *(Data Master registration card must be on file!)*

IRON CROSS

by John & Michael Galus

The German invasion of Russia began at 0300 on 22 June 1941. Two massive armies faced each other in a titanic struggle which would decide World War II. The object of IRON CROSS is to defeat the Russian forces controlled by the computer & to take control of the Russian cities.

Requires 64K, Ext. Basic, Disk. $24.95

Data Master

by BJ Chambless

Simplify with pull-down menus

All options are available from anywhere in the program. To make it even simpler, each menu option can be invoked by a single character!

Dialog boxes

Pop-up windows display current settings and available choices.

Unique LIST display format

You view data in easy-to-read rows & columns. From this easy-to-read screen you may edit your data, without having to exit. Mass changes are a snap!

For even more power, use an access key to selectively display a subset of records and can change them right on the screen!

Compatibility with OS-9 Profile & Data Bank

You won't lose any of your valuable data!

Easy Expansion

with re-definition of records and transfer of files.

Elements & Records:

Each record can contain up to 512 characters used within 35 elements. Elements are defined as: alphanumeric (descriptive data), math (real numbers including dollars & cents), date, and derived (formulas calculated from other elements in the same record). You can store any type of data using these field types!

Display & Entry Screens

Design up to 9 different screen formats for data display and data entry for each data base. This is helpful for accessing your data for different purposes.

Sorts & Selections:

Up to 9 different access keys can be defined. These are used for displaying data on the screen or selecting data for printing. You may use several levels of sorts as well as logical operators to select just the right data. A powerful generic search is also available.

Reports:

See your data any way you want by designing your own reports! Data Master offers easy-to-use tools to design professional reports including report headings, titles, column headings, automatic page numbers, column totals, and more. Store up to 9 report formats for each data base.

File Management

Built-in file management capabilities allow easy file manipulation for transferring data files, renaming data files, expanding data files, and more.

Upload/Download

Data Master can read and write standard sequential files which aids in data transfer between DynaCalc and many others.

Full keyboard ease

taking full advantage of the CoCo 3's cursor and function keys.

OS-9 accessible

Even while operating within *Data Master*.

Requires OS-9 Level II, CoCo 3, 512K $64.95

Screen Star

by Scott Cabit

Also available from Radio Shack through Express Order Software

Screen Star implements the popular **WordStar** editing capabilities. If you know WordStar you already know how to use **Screen Star!**

- **Edit files larger than memory** since Screen Star uses the disk as an extension of memory.
- **Block Commands** – with a keystroke you can mark the start and end of a block, then move, copy, or delete the block.
- **Cursor Movement** is easy with an array of commands to move left or right one character, or one word, or one line; scroll forward or back one line, one screen, one block; jump to the start or end of the line or the screen, block, or file.
- **Find & Find/Replace Commands** make mass changes and searches a snap.
- **Pop-Up Help Menus** are as close as a keystroke.
- **Closing Commands** let you exit the editor with or without save, and can import or export files whenever you need them.
- **Smart Speller** is included.
- **Parameter commands** personalize your environment.
- **Access the OS-9 Shell.**
- **Up to 10 functions keys** can be defined by CoCo 3 users for fast, repetitive functions.
- **Use with the Text Formatter** for a full word processing team. Simply imbed the Text Formatter commands in your Screen Star file and it will be printed in style!
- **Level 1 & Level 2** are supported and both versions are included.

Requires OS-9 Disk $49.95
With Text Formatter $74.95

OS-9 Text Formatter

Also available from Radio Shack through Express Order Software

An easy way to get beautiful documents and letters with OS-9, Text Formatter interfaces with any editor that produces standard ASCII text files.

Features include left and right **justification,** page breaks, special spacing, automatic **pagination,** automatic **page numbering, centering, indenting, tabs,** and sending **escape and control codes** to your printer as well as sophisticated **headers and footers.** Special functions include **macros** for often used sequences, relative arguments, upper and lower case modes, nonprintable remarks, and more!

Requires OS-9 $34.95

call or write today for FREE Catalog

Color Connection

This is the most comprehensive modem package for the CoCo! **All protocols are supported** including Compuserve Protocol B, XMODEM, and XON/XOFF. **Auto dial** feature for both Hayes compatible and some Radio Shack modems. You can use **all baud rates** when using the Radio Shack Deluxe RS232 program pack! Printer baud rates are selectable.

You can **print from the buffer** and files bigger than the buffer can be uploaded and downloaded. **Download direct to disk** with automatic XON/XOFF protocol. **Single key macros** allow easy entry of often used passwords and IDs. **Hi-res screens** with a choice of colors are used. All printable characters are available and all control characters are supported.

RSDOS Disk $49.95 **OS-9 Disk** RS232 pak is required. $49.95

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VISA MasterCard
Card # ____________________ Exp. ______
Signature ____________________

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3% for orders over $100
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6% for orders over $100
Checks are delayed for bank clearance

6½% Calif. Sales Tax ______
COD Add $5 ______
Shipping* ______
TOTAL ______

```
1300 DATA ..WWWWW..
1310 DATA ..WWWWW..
1320 DATA ...WWW...
1330 DATA .........
1340 DATA .........
1350 DATA .........
1360 DATA 18322,3,11,0
1370 DATA .........
1380 DATA .........
1390 DATA ...WWW...
1400 DATA ..WWWWW..
1410 DATA .WWWWWWW.
1420 DATA .WWWWWWW.
1430 DATA .WWWWWWW.
1440 DATA ..WWWWW..
1450 DATA ...WWW...
1460 DATA .........
1470 DATA .........
1480 DATA 18456,3,11,0
1490 DATA ...WWW...
1500 DATA ..WWWWW..
1510 DATA .WWWWWWW.
1520 DATA WWWWWWWWW
1530 DATA WWWWWWWWW
1540 DATA WWWWWWWWW
1550 DATA WWWWWWWWW
1560 DATA WWWWWWWWW
1570 DATA .WWWWWWW.
1580 DATA ..WWWWW..
1590 DATA ...WWW...
1600 DATA 18590,3,11,0
1610 DATA ...WWW...
1620 DATA ..WWWWW..
1630 DATA .WWWWWWW.
1640 DATA WWWWWWWWW
1650 DATA WWWB.OWWW
1660 DATA WWW...WWW
1670 DATA WWWB.OWWW
1680 DATA WWWWWWWWW
1690 DATA .WWWWWWW.
1700 DATA ..WWWWW..
1710 DATA ...WWW...
1720 DATA 18724,3,11,0
1730 DATA ...WWW...
1740 DATA ..WWWWW..
1750 DATA .WWW.WWW.
1760 DATA WWW...WWW
1770 DATA WW.....WW
1780 DATA WW.....WW
1790 DATA WW.....WW
1800 DATA WWW...WWW
1810 DATA .WWW.WWW.
1820 DATA ..WWWWW..
1830 DATA ...WWW...
1840 DATA 18858,3,11,0
1850 DATA ...WWW...
1860 DATA ..WW.WW..
1870 DATA .WW...WW.
1880 DATA WW.....WW
1890 DATA W.......W
1900 DATA W.......W
1910 DATA W.......W
1920 DATA WW.....WW
1930 DATA .WW...WW.
1940 DATA ..WW.WW..
1950 DATA ...WWW...
1960 DATA 19515,3,7,0
1970 DATA BB.......
1980 DATA BBB......
1990 DATA .BBBBBWW.
2000 DATA .BBBBBBBB
2010 DATA ..OOOO...
2020 DATA ..BBB....
2030 DATA .BBB.....
2040 DATA 19601,3,7,0
2050 DATA .......BB
2060 DATA ......BBB
2070 DATA .WWBBBBB.
2080 DATA BBBBBBBB.
2090 DATA ...OOOO..
2100 DATA ....BBB..
2110 DATA .....BBB.
2120 DATA 11200,4,11,0
2130 DATA OOWO.BBB.OOWO
2140 DATA OOWO.BBB.OOWO
2150 DATA OOWOBBBBBOOWO
2160 DATA ...BBBBBBB...
2170 DATA .WWWWWWWWWWW.
2180 DATA WWOOOOOOOOOWW
2190 DATA W.BBBBBBBBB.W
2200 DATA .B.W..W..W.B.
2210 DATA .BOWBOWBOWBB.
2220 DATA .B.W..W..W.B.
2230 DATA ..BBBBBBBBB..
2240 DATA 11378,3,6,0
2250 DATA .W.......
2260 DATA ..W......
2270 DATA ...W.....
2280 DATA ....W....
2290 DATA .....W...
2300 DATA ......W..
2310 DATA 14336,3,6,0
2320 DATA ...W.....
2330 DATA ...W.....
2340 DATA ....W....
2350 DATA .....W...
2360 DATA .....W...
2370 DATA ......W..
2380 DATA 11452,3,6,0
2390 DATA ....W....
2400 DATA ....W....
2410 DATA .....W...
2420 DATA .....W...
2430 DATA ......W..
2440 DATA ......W..
2450 DATA 14508,3,6,0
2460 DATA .....W...
2470 DATA .....W...
2480 DATA .....W...
2490 DATA .....W...
2500 DATA ......W..
2510 DATA ......W..
```

TEXTPRO-IV

"The ULTIMATE Color Computer III Word Processing System"

- **9 Hi-Res Displays from 58 to 212 columns by 24 lines in 225 Res.**
- **Screen Display of Bold, Italic, Underline & Double Width print.**
- **9 Proportional Character Sets Supported with full Justification.**
- **80 Programmable Function Keys & Loadable Function key sets.**
- **Three Programmable Headers and One Programmable Footer.**
- **Automatic Footnote System places lines at the bottom of a page.**
- **7 Tab Commands, with: Center, Left, Right and Decimal align.**
- **Autoexecute Startup files for easy printer & system setup.**
- **8 Pre-Defined & 10 Programmable printer function commands.**
- **Supports Library files for unlimited printing & configurations.**
- **Disk file record access for Mail Merge & Boiler Plate printing.**
- **Complete Automatic Justification, Centering, Flush left & right.**
- **Change indents, margins, line length, etc. anytime in the text.**
- **Create and Edit files larger than memory, up to a full disk.**
- **Easily imbed any number of printer format and control codes.**
- **Compatible with all printers including Laser printers.**
- **Built in Ultra Fast 2 drive RAMDISK for 512K support.**

TEXTPRO IV is the most Powerful Word Processing System available for the COCO-3, designed for speed, flexability and extensive document processing. It is not like most of the other word processing programs available for the Color Computer. If you are looking for a simple word processor to write letters or other hort documents, and never expect to use multiple fonts or proportional printing, hen most likely you'll be better off with one of the other simple word processors. But, if you want a powerful word processor with extensive document formatting eatures to handle large documents, term papers, manuals, complex formatting problems and letter writing, then TEXTPRO IV is the answer. It works in a otally different way than most word processing programs. It uses simple 2 character abbreviations of words or phrases for commands and formatting nformation that you imbed directly in your text. There are over 70 different ormatting commands you can use without ever leaving the text your working on. There are no time comsuming and frustrating menu chases, you are in total control at all times. You can display the formatted document on the screen before a single word is ever printed on your printer. Including margins, headers, footers, page numbers, page breaks, column formatting, justification, and Bold, Italic, Underline, Double Width, Superscript and Subscript characters.

TEXTPRO IV can even support LASER PRINTERS with proportional fonts, ake a good look at this AD? It was done with TEXTPRO IV on an OKIDATA LASERLINE-6 laser printer!!! All of the character sets used on this AD are proportional, all centering, justification, font selection, and text printing was performed automatically by TEXTPRO IV.

What you see is what you get!

TEXTPRO IV has 9 Hi-Resolution screen fonts to choose from, with 58 to 212 characters per line in 225 Resolution, for the best display possible. You can easily match the width of your printed page to the screen and you can have it automatically change display widths as you change printer fonts so you can even display the "fine print". All of the screen fonts can display, Bold, Italic, Underline, Superscript, Subscript and Double Width characters. When you you want to see what your printed document will look like, TEXTPRO IV will let you see it on the screen in all its glory, so that, "What you see is what you get".

Standard Commands

TEXTPRO IV has all the document formatting commands you expect in a word processor and then some. The setup commands include: line length, top margin, bottom margin, page length, page numbering on/off, page format on/off, automatic word fill on/off and justification left, center, right or full. Some of the Vertical control features include: Test for a number of lines left on a page, skip to next page, set page number, page pause, single and multiple line spacing.

TEXTPRO IV features 3 programmable Header lines that can be centered, left or right justified and one programmable Footer line. There are 3 commands for continious, single and paragraph indenting, Center Text, Center Line and Right Justify text with character fill.

Printer & Special Commands

TEXTPRO IV has 8 pre-defined printer & screen commands for Bold, Italic, Double Width, Underline, Subscript, Superscript, Condensed and Double Strike *print.* It also has 10 programmable functions that you can use to access intelligent printer features like: Graphics, variable line spacing, half line feed, horizontal & vertical positioning. There are also 3 other printer commands that allow you to imbed control code sequences anywhere in the text.

There is a Footnote command that will automatically place footnotes at the bottom of the page. Another command allows you to display a message on the screen and input text from the keyboard, to be included in your printed document. There is also a repeat command that allows you to repeat an entire document or part of one, up to 255 times.

Tab Functions

TEXTPRO IV features an elaborate system of tab commands for complete control over column formatting. There are 10 programmable tab stops that can be defined and re-defined at any time. They can be used to: Center over Tab column, Right Justify to Tab column, Decimal Align over Tab column, Left Justify to Tab column (Normal Tab) and Horizontal Tab. They can also be used with a numeric column position for maximum flexibility.

Proportional Fonts & Printing

TEXTPRO IV is the only Color Computer III Word Processing system that gives you Justified Proportion Printing, which can give your documents and letters that professional touch that just isn't obtainable with fixed or mono spaced printing. And just about all printers today support proportional fonts, and with Laser Printers you can get typesetting quality output for just pennies a page. TEXTPRO IV supports up to 9 proportional fonts, with full justification. And, you can even mix mono spaced and proportional fonts for maximum flexability. Even if you don't use proportional printing, you can select between Pica, Elite and Condensed fixed width fonts to get fully justified printing.

Mail Merge and Text Processing Disk Functions

TEXTPRO IV supports several commands that allow you to import data or text from other disk files. They allow you to include information like names and addresses for Mail Merge capability, Import standard paragraphs or other information for Boiler Plate type functions and more. Some of the commands include: Open a file, Field a Record, Read a Record into fielded variables, Read single or multiple lines and Trim spaces from the trailing end of fielded variables.

Another powerful disk function not to be overlooked is the "LIBRARY" command that allows you to include the entire contents of a file in your text. This can be very useful for a great many applications. You can use a Library command to automatically include a standard or optional printer setup command file, or to include standard paragraphs, headers or information created from a spread sheet or any other program. And, for printing very large documents that consist of several files linked together.

Autoexec Startup Files

TEXTPRO IV will automatically load and execute a command text file when it first executes. This allows you to customize the program configuration for your system and printer whenever you startup TEXTPRO IV. You can setup the screen display format, colors, adjust automatic key repeat, printer baud rate, load a set of function keys, load your printers control codes and more.

80 Programmable Function Keys

TEXTPRO IV allows you to have up to 80 function keys with just about any kind of information or command sequences you can imagine. Once programmed, you can have a command sequence execute using a single function key. You can also Save and Load function key sets at any time. So, you can have several sets for different writing tasks or projects, the possibilities are endless. Just think, with a single function key you could, load a disk file, search for and replace all the occurances of a phrase, save the file back to disk, have it processed and printed!

Text Editing

TEXTPRO IV has a powerful, full featured, line oriented screen editor that is faster and more efficient then most editors you've ever worked with. It supports single or multiple line copy and move, global or local search and replace, word and character insert/delete, block delete and much more. It features adjustable automatic key repeat, selectable display foreground and background colors, screen line width and more.

TEXTPRO IV uses fully compatible ASCII formatted files. You can even direct formatted output files to a standard ASCII disk file. It will Load, Save, Append, Kill, Text Process files from disk, Roll part of a file to disk, Get next portion of a file, display a Directory and Backup Ramdisk to & from Floppy disks.

TEXTPRO IV's files are also compatible with spelling checker programs like Spell 'n Fix from Star Kits, a shareware program, available with TEXTPRO IV for your evaluation, just for the asking.

Fully Buffered Keyboard

While many word processing programs are slow and often lose keystrokes. TEXTPRO IV has a fully buffered keyboard that is virtually impossible to out type. Even when it's busy, it will still remember the keystrokes entered. You can enter in commands or whatever, even during insert mode you'll never lose a key.

Professional Word Processing Power

TEXTPRO IV is a powerful tool for both the Casual and Professional Word Processing user. It offers a wide range of features and functions that can satisfy even the most demanding writer. Even though you may not need all of TEXTPRO IV's power and flexability right now, its not a program that you can easily outgrow. As your needs and skills improve, you'll discover that you won't need to go out and buy another word processing program, TEXTPRO IV will already be ready and waiting. No Text Processing program available for the Color Computer III gives you more Text Processing Power than TEXTPRO IV. It can make your writing appear more professional than you ever thought possible. Check around, see what other word processing programs have to offer in terms of power, speed and flexability. When your finished comparing them against TEXTPRO IV, you'll see that it's the only real choice for the Color Computer III.

Requires 128K & Disk $89.95

To order TEXTPRO IV by mail, send check or money order for the amount of purchase, plus $3.00 for shipping & handling to the address below.
To Order by VISA, MASTERCARD or COD call us at (702) 452-0632
(Monday thru Saturday, 8am to 5pm PST)

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Las Vegas, Nevada 89110
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Coming Soon: CoCo 1 & 2 versions of TEXTPRO IV

```
2520 DATA 14848,3,6,0
2530 DATA .....W...
2540 DATA .....W...
2550 DATA .....W...
2560 DATA ......W..
2570 DATA ......W..
2580 DATA ......W..
2590 DATA 14656,3,6,0
2600 DATA .....W...
2610 DATA .....W...
2620 DATA ......W..
2630 DATA ......W..
2640 DATA ......W..
2650 DATA ......W..
2660 DATA 11526,3,6,0
2670 DATA ......W..
2680 DATA ......W..
2690 DATA ......W..
2700 DATA ......W..
2710 DATA ......W..
2720 DATA ......W..
2730 DATA 14730,3,6,0
2740 DATA .......W.
2750 DATA .......W.
2760 DATA ......W..
2770 DATA ......W..
2780 DATA ......W..
2790 DATA ......W..
2800 DATA 14922,3,6,0
2810 DATA .......W.
2820 DATA .......W.
2830 DATA .......W.
2840 DATA ......W..
2850 DATA ......W..
2860 DATA ......W..
2870 DATA 14582,3,6,0
2880 DATA .......W.
2890 DATA .......W.
2900 DATA .......W.
2910 DATA .......W.
2920 DATA ......W..
2930 DATA ......W..
2940 DATA 11600,3,6,0
2950 DATA ........W
2960 DATA ........W
2970 DATA .......W.
2980 DATA .......W.
2990 DATA ......W..
3000 DATA ......W..
3010 DATA 14410,4,6,0
3020 DATA .........W...
3030 DATA .........W...
3040 DATA ........W....
3050 DATA .......W.....
3060 DATA .......W.....
3070 DATA ......W......
3080 DATA 11674,4,6,0
3090 DATA ...........W.
3100 DATA ..........W..
3110 DATA .........W...
3120 DATA ........W....
3130 DATA .......W.....
3140 DATA ......W......
3150 DATA 19687,1,70,1
3160 DATA ..W..
3170 DATA .W.W.
3180 DATA .W.W.
3190 DATA .W.W.
3200 DATA .W.W.
3210 DATA .W.W.
3220 DATA ..W..
3230 DATA ..W..
3240 DATA .WW..
3250 DATA ..W..
3260 DATA ..W..
3270 DATA ..W..
3280 DATA ..W..
3290 DATA .WWW.
3300 DATA ..W..
3310 DATA .W.W.
3320 DATA ...W.
3330 DATA ..W..
3340 DATA .W...
3350 DATA .W...
3360 DATA .WWW.
3370 DATA ..W..
3380 DATA .W.W.
3390 DATA ...W.
3400 DATA ..W..
3410 DATA ...W.
3420 DATA .W.W.
3430 DATA ..W..
3440 DATA .W...
3450 DATA .W.W.
3460 DATA .W.W.
3470 DATA .WWW.
3480 DATA ...W.
3490 DATA ...W.
3500 DATA ...W.
3510 DATA .WWW.
3520 DATA .W...
3530 DATA .W...
3540 DATA .WW..
3550 DATA ...W.
3560 DATA ...W.
3570 DATA .WW..
3580 DATA ..W..
3590 DATA .W...
3600 DATA .W...
3610 DATA .WW..
3620 DATA .W.W.
3630 DATA .W.W.
3640 DATA ..W..
3650 DATA .WWW.
3660 DATA ...W.
3670 DATA ...W.
3680 DATA ..WW.
3690 DATA ..W..
3700 DATA ..W..
3710 DATA ..W..
3720 DATA ..W..
3730 DATA .W.W.
3740 DATA .W.W.
3750 DATA ..W..
3760 DATA .W.W.
3770 DATA .W.W.
3780 DATA ..W..
3790 DATA ..W..
3800 DATA .W.W.
3810 DATA .W.W.
3820 DATA ..WW.
3830 DATA ...W.
3840 DATA .W.W.
3850 DATA ..W..
3860 DATA 0
```

Listing 3: BLITZ3

```
10 CLS:CLEAR200,&H29FF:C=0:FORN=
0TO14:READA$:A=VAL("&H"+A$):C=C+
A:POKEN+&H2A00,A:NEXT:READD:IFD<
>C THENPRINT"CHECKSUM ERROR!":EN
DELSEEXEC&H2A00
20 INPUT"FILENAME TO SAVE AS";F$
:IFF$=""THEN20
30 INPUT"TO (T)APE OR (D)ISK";A$
:A$=LEFT$(A$,1):IFA$="T"THEN50EL
SEIFA$<>"D"THEN30
40 SAVEM F$,&H2B00,&H5000,&H3003
:GOTO60
50 CSAVEM F$,&H2B00,&H5000,&H300
3
60 INPUT"ANOTHER COPY (Y/N)";A$:
A$=LEFT$(A$,1):IFA$="Y"THEN50ELS
EIFA$<>"N"THEN60
70 EXEC&H3003 'BUSINESS IS FINI
SHED, LET'S PLAY THAT GAME!
80 DATA 8E,2A,0F
90 DATA A6,89,2E,E0
100 DATA A7,80
110 DATA 8C,51,20
120 DATA 26,F5
130 DATA 39
140 DATA 1660
```

CBASIC-III

The ULTIMATE Color Computer III Basic Compiler!!!

If you want to write fast efficient Machine Language Programs and you don't want to spend the next few years trying to learn how to write them in Assembly language or with a cheap compiler, then CBASIC III is the answer!!!

CBASIC III is the only fully integrated Basic Compiler and Program Editing System available for the Color Computer 3. It will allow you to take full advantage of all the capabilities available in your CoCo-3 including 512K RAM, without having to spend years trying to learn assembly language programming. CBASIC III allows you to create, edit and convert programs from a language you are already familiar with Enhanced Disk Color Basic, into fast efficient machine language programs easily and quickly. CBASIC III supports all the enhanced hardware available in the CoCo-3, including Hi-Res Graphics, & Screen displays, Extended Memory and Interrupts (Keyboard, Timer, Serial & Clock). It is 99% syntax compatible with Enhanced Disk Color Basic, so most Basic programs can be loaded and compiled with little or no changes required.

The compiler is an optomizing two-pass integer compiler that converts programs written in Basic into 100% pure 6809 Machine Language programs which are written directly to disk in a LOADM compatible format. The programs generated by the compiler are run as complete stand alone programs. A built in linker/editor will automatically select one and only one copy of each run-time library subroutine that is required and insert them directly in the program. This eliminates the need for cumbersome, often wasteful "run-time" packages.

CBASIC III is for both Beginning & Advanced Users

CBASIC III is a Powerful tool for the Beginner or Novice programmer as well as the Advanced Basic or Machine Language programmer. You can write programs without having to worry about Stack Pointers, DP registers, memory allocation, and so on, because CBASIC III will handle it for you automatically. All you have to do is write programs using the standard Basic statements and syntax. For the Advanced Basic and Machine Language programmers, CBASIC III will let you take command and control every aspect of your program, even generating machine code directly in a program for specialized routines.

CBASIC III adds many features not found in Color Basic, like Interrupt and Reset handling, to give you a level of control only available to very advanced Machine Language programmers. Plus, we made it exceptionally easy to use, not like some other compilers. CBASIC III is the friendliest and easiest compiler available for the Color Computer III.

CBASIC III has Full Command Support & Speed

CBASIC III features well over 150 Basic Commands and Functions that fully support Disk Sequential and Direct access files, Tape, Printer and Screen I/O. It also supports ALL the High and Low Resolution Graphics, Sound, Play and String Operations available in Enhanced Color Basic, including Graphics H/GET, H/PUT, H/PLAY and H/DRAW, all with 99.9% syntax compatibility. CBASIC III also supports the built in Serial I/O port with separate programmable printer & serial I/O baud rates. You can send and receive data with easy to use PRINT, INPUT, INKEY, GETCHAR and PUTCHAR commands.

CBASIC III is FAST. Not only will CBASIC III compiled programs execute 10 to several 100 times faster than Basic, but the time it takes to develop a CBASIC III program verses writing a machine language program is much, much shorter. A machine language program that might take several months to write and debug could be created using CBASIC III in a matter of days or hours, even for a well experienced machine language programmer. We had a report from one CBASIC user that claimed "a Basic program that used to take 3 hours to run, now runs in 7 to 8 minutes". Another user reported a program that took 1 to 1 & 1/2 hours to run in Basic, Now runs in 5 to 6 minutes!!!.

CBASIC III is more than just a Compiler

CBASIC III has its own completely integrated Basic Program Editor, that can be used to create and/or Edit programs for the compiler. It is a full featured editor with functions designed specifically for writing and editing Basic programs. It has built in block Move and Copy functions with automatic program renumbering. Complete, easy to use inserting, deleting, extending and overtyping of existing program lines. It is also used for Loading, Saving, Appending (merging), Killing disk files and displaying a disk Directory. It also has automatic line number generation for use when creating programs or inserting sequential lines between existing lines. You can set the printer baud rate and direct normal or compiled listings to the printer for hard copy. The built in editor makes program corrections and changes as easy as "falling off a log". If CBASIC III finds an error when compiling, it points to the place in the program line where the error occured. All you have to do is tell the editor what line you want to start editing and when it is displayed, move the cursor with the arrow keys to the place where the error is and correct it. Just like that, it's simple.

Selectable 32/40/64/80 Column Displays in 192 or 225 Res.

CBASIC III is the only Color Basic Compiler that includes it's own 32, 40, 64 or 80 by 24 line display in 192 or 225 Resolution. All of these display formats are part of the standard CBASIC III compiler package. Not only can they be used for normal program editing and compiling, but can also be included in your compiled programs, with a single command, "HIRES"!! The run-time display package is not just a simple "WIDTH 80" display, but a full featured package, far more advanced than the "WIDTH 40 or 80" displays. It will let you do things you expect like "PRINT @" as well as X,Y positioning. You can select characters per line, underline, character highlight, erase to end of line or screen, home cursor, home & clear screen, protect screen lines, and much more.

128K and 512K RAM Support

CBASIC III makes full use of the powerful and flexible GIMI chip in the Color Computer 3. It will fully utilize the 128K of RAM available and install 2 Ultra Fast Ramdisks if 512K is available, for program Creation Editing and Compilation. You can easily access all 512K of memory in a Compiled program thru several extended memory commands that can access it in 32K or 8K block and single or double bytes. CBASIC III also allows your program to use the upper 32K of RAM space automatically for variables or even program storage at run-time. It will automatically switch the RAMs in and out when needed. There are also two other commands that allow you to control the upper 32K of RAM manually, under program control. No other Color Basic compiler directly supports the use of Extended RAM like CBASIC III.

All Machine Language

CBASIC III is completely written in fast efficient Machine Language, not Basic, like some other Color Basic compilers. Because of this, CBASIC III can edit and compile very large programs, even using the 80 column displays it can handle almost 40K of program. Some of the other Basic compilers can only work with 16K or about 200 lines. Even working with large programs, CBASIC III compiles programs with lightning fast speed. It will compile a 24K program to disk in less than 2 minutes! That's without a listing being generated. We've heard stories about some other compilers that take almost 10 minutes to compile a simple 2-3K program. You might inquire about this when you look at some of the other compilers available.

Compare the Difference

CBASIC III is not just another Color Basic Compiler. It is the only complete Basic Compiler System for the Color Computer. Compare CBASIC III's features to what other compilers offer and you'll see the difference. When comparing CBASIC III to other compilers you might want to keep some of these questions in mind. Does it support I/O functions? You can't write much of a program without PRINT, INPUT and so on. What about complex string statements, or strings statements at all? Can you compile a complex string like: MID$(RIGHT$(DA$(VAL(IN$),LEN(LE$)),3,3)? How large of a programcan you write? Can you use two character variable names for string & numeric variables, like Basic? Does it support all the Hi-Res graphics statements including H/PLAY, H/DRAW, H/GET and H/PUT, using the same syntax as Basic? Do you ever have to use a separate Basic program? How long would it take to compile a 24K program? Can you take complete Basic programs an compile them without extensive changes? Will they work? How do you edit a program when it has errors compiling?

The Finished Product

Since CBASIC III contains statements to support ALL of the I/O devices (Disk, Tape, Screen & Printer), Hi-Res Graphics, Sound, and Enhanced Screen displays, it is well suited for a wide range of programming applications. When CBASIC III compiles a program, it generates a complete, Ready to Run machine language program. The finished product or program does not have to be interfaced to a Basic program to perform some of its functions or commands. This may seem obvious to you, but some of the other Color Basic compilers don't necessarily work this way. Some of their compiler commands need a separate Basic program in order for them to work. In some cases, they require that a separate Basic program be interfaced to the compiled program to perform I/O functions, like INPUT, PRINT and so on. CBASIC III doesn't do this, ALL of it's commands are compiled into a single machine language program, that does not require any kind of Basic program to make it work.

Price Verses Performance

The price of CBASIC III is $149.00, it is the most expensive Color Basic Compiler on the market, and well worth the investment. We spent over 3 years writing and refining CBASIC III, to make it the Best, most Compatible Color Basic compiler available. Most of our CBASIC III users already bought one or more of the other compilers on the market and have since discarded them. Before you buy a compiler, compare the performance of CBASIC III against any Color Basic compiler. Dollar for Dollar CBASIC III gives you more than any other Color Basic compiler available.

Requires 128K & Disk $149.00

"Over the years, few products have impressed me as much as this one." ....The Rainbow, December 1987

To order CBASIC III by mail, send check or money order for the amount of purchase, plus $3.00 for shipping & handling to the address below.
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NOVICES NICHE

THE RAINBOW is a teaching environment and we realize that the majority of our readers will always be beginners. In our continuing effort to always keep the new user in mind, and in addition to the many beginner feature articles and programs published in every issue, "Novices Niche" contains shorter BASIC program listings that entertain as well as help the new user gain expertise in all aspects of the Color Computer: graphics, music, games, utilities, education, programming, etc.

Music & Sound

Calibrate Your Ears

4K

By Lauren Willoughby
Rainbow Reviews Editor

What's the reviews editor doing writing a program? Making a fool of herself, probably. But I have another title around here: head novice (as in the novice behind Novices Niche). Seeing all the neat applications that can be shoehorned into just a few inches of coding made me itch to write a short program myself. So here it is.

Pitch Tester is based on a display I saw several years ago at the Museum of Science and Industry in Chicago. One whole wall was taken up by a "music computer" that could test your ability to remember pitches. Having had a little musical training (I do stress "little"), I smugly put my ear to the test. The computer sang a pitch for me to memorize. Then I was given a second pitch, which I had to adjust higher or lower to match the first. The results were not encouraging. (Maybe I was the source of all those funny noises coming from the woodwind section!)

Pitch Tester works the same way. It gives you a pitch to memorize and then instructs you to match a second pitch to the first by using your right joystick. You'll find out if your ear is sharp, flat or just right.

The listing: PITCHER

```
0 'PITCH TESTER
2 CLS6:PRINT@256,"          MEMORIZE
THIS PITCH!"
5 X=RND(255):SOUNDX,50
8 CLS4:PRINT@192,"      NOW MATCH I
T! USE YOUR RIGHT JOYSTICK TO AD
JUST THE TONE UP  OR DOWN. PRESS
 THE BUTTON WHEN  YOU THINK YOU
HAVE IT."
9 FOR D=1TO300:NEXTD
10 S=RND(255)
27 IF S>255 THEN S=255
28 IF S<1 THEN S=1
29 SOUND S,1
30 H=JOYSTK(0):V=JOYSTK(1)
35 IF V<1 THEN S=S+3
37 IF V<25 THEN S=S+1
40 IF V>37 THEN S=S-1
43 IF V>62 THEN S=S-3
50 P=PEEK(65280)
60 IF P=126 THEN 83
70 IF P=254 THEN 83
80 GOTO 27
83 A=ABS(S-X)
85 IF S>X THEN E$="SHARP"
87 IF S<X THEN E$="FLAT"
89 IF S=X THEN E$="PERFECT"
91 IF A<4 AND A>0 THEN E$="GOOD"
100 CLS3:PRINT@32,"MY PITCH WAS"
;X:PRINT@128,"YOUR PITCH WAS";S
110 PRINT@224,"DIFFERENCE OF";A;
"PITCH UNITS"
120 PRINT@320,"YOUR EAR IS ";E$
130 PRINT@416,"DO YOU WANT TO PL
AY AGAIN?":INPUT"Y/N";R$
135 IF R$="Y" THEN0 ELSE CLS:END
```

Too Many (hic) Bottles of Beer

16K
ECB

By Bernice Shoobs

Do you need some happenin' music for that ultimate party? Let CoCo spin the ultimate party song for you — "99 Bottles of Beer" (that's "99 Bottles of Root Beer" for those of you under 21).

The listing: 99BEERS

```
1 '"THE BEER SONG"
2 'BY:BERNICE SHOOBS,CLIFTON,N.J
.
10 'THIS WILL PLAY 99 BOTTLES OF
20 'BEER ALL THE WAY DOWN TO ONE
30 'IF YOU DON'T WANT TO GET
40 'BOOZED TO THE GILLS,---
50 'KEY IN A NO. LOWER THAN 99
51 'AT LINE 70
52 CLS
53 PRINT@265,"THE BEER SONG"
54 PRINT@297,STRING$(13,"-")
55 FOR T= 1 TO 2000:NEXT T
60 CLS 2
70 FORN=99TO 1 STEP -1
80 PRINT @0,N;"BOTTLES OF BEER O
N THE WALL"
90 PLAY "L8;G;G;G;D;D;D;G;G;G;L2
;G"
100 PRINT @96,N;"BOTTLES OF BEER
"
110 PLAY "L8;A;A;A;E;E;E;L2;A"
120 PRINT @192,"         TAKE ON
E DOWN,              PASS IT
AROUND..."
130 PLAY"G;L8;F#;F#;F#;F#;F#;F#;
F#;F#;F#;L2F#;
140 PRINT @352,N-1;"BOTTLES OF B
EER ON THE WALL"
150 PLAY"L8;D;D;D;D;E;F#;G;G;G;L
2;G"
160 NEXT N
170 CLS
180 PALETTE 13,36:PALETTE 12,0
190 PRINT @263, "A L L   G O N E
 !!!"
200 PRINT@295,STRING$(19,"=")
210 PLAY "L2;D L1G"
220 GOTO 220
230 'PLEASE KEY PALETTE CMP/RGB
240 'AFTER BREAKING THE PROGRAM
250 'TO GO BACK TO NORMAL SCREEN
```

Adventures in Music

16K
ECB

By Gip Wayne Plaster

The first program I had published was a simple music program I called *Explorers* (June 1987 Novices Niche, Page 81), but I thought it was unique in that it told a story along with playing music. I've written two more hair-raising, musically enhanced narrations for people who like a little adventure with their music, *Explorers — the CoCo Strikes Back* and *The Unexplored Cave.*

Listing 1: EXPLORE2

```
10 CLS
20 PRINT@128,STRING$(32,"*");
30 PRINT@288,STRING$(32,"*");
40 PRINT@194,"EXPLORERS--BY GIP
W. PLASTER";
50 FORX=1TO500:NEXTX
60 PRINT@161,"m o r e"
70 PRINT@416," REMEMBER THAT SOU
ND ??????????"
80 FORP=1TO3
90 FORI=255TO200STEP-1
100 POKE140,I:EXEC43345:NEXTI
110 NEXTP
120 FORI=255TO1STEP-1
130 POKE140,I:EXEC43345:NEXTI
140 PRINT@416
150 PLAY"O1;T3;CDEFGAB;P8;B;P8;B
AB"
160 PLAY"T5;L3;CDEFGCCDDEEFGGFFE
EDDCC"
170 PLAY"L6;CDEFGFEDCAGAGAGAGAFA
FAFADADADAEAEAEACACACABABABBBBAA
AGGGFFF;L1;GF;P4;"
180 FORN=1TO2
190 PLAY"L5;GFDCDFGFDCDFEDFCGFDD
AEDCFGDFGFDEDCFGFDA;L4;GGGGFFFFE
EECDCECFCGCCFCDCEDECEFEGEDECEFE
GEFEDECE;L4;F;"
200 NEXTN
210 PRINT@416,"SOMETHING ELSE IS
 ATTACKING ..."
220 FORAA=1TO150:POKE140,200:EXE
C43345:NEXTAA
230 FORL=1TO500:NEXTL
240 PLAY"ED;T2;C;T1;CCC;V8;B;V13
;C"
250 PLAY"O1;L2.;GAG;V22;P10;G"
260 FORL=1TO500:NEXTL:CLS
```

Listing 2: THECAVE

```
10 CLS0:FORLL=1TO500:NEXTLL
20 CLS
30 PRINT:PRINT:PRINT:PRINT:PRINT
"THE UNEXPLORED CAVE---"
40 PRINT"    WHAT IS AWAITING IN
SIDE ???"
50 PLAY"O1;T5;"
60 PLAY"L16;CDEFGABCDEFGABCDEFGA
```

```
BCDEFGABCDEFGAB;L8;CDEFGABCDEFGA
B;"
70 PRINT"LET'S GO CHECK IT OUT..
."
80 PRINT"EVERYTHING'S GOOD SO FA
R..."
90 PLAY"CCCCCDDDDEEEFFG;FFFFFEEE
EDDDCC;DDDDDEEEEFFFGGG;L4;FF;L2;
G;L4;CC;L2;D;"
100 PRINT"THERE'S SOMETHING STRA
NGE..."
110 PRINT"JUST MY IMAGINATION...
"
120 PLAY"L1;CDE;L2;CDEDC;L4;CDED
C;L1;FF;GG;O2;GFDFGFDFGFECCDEAB;
O3;CFEDGACFEDGA;O2;GGFEDC;"
130 CLS0:CLS:CLS2:CLS3:CLS4:CLS5
:CLS:PRINT:PRINT"I WAS RIGHT---
IT IS THE PURPLE    COLOR COMPUTE
R EATER !!!!!!!"
140 FORA=1TO3
150 FORAA=1TO130:POKE140,AA:EXEC
43345:NEXTAA:FORAA=30TO1STEP-1:P
OKE140,AA:EXEC43345:NEXTAA
160 NEXTA
170 PRINT:PRINT:PRINT"I THINK WE
 WILL GET AWAY..."
180 PLAY"L3;AABBAAGGFFGGDDEECCDD
EECCFFEEGG;"
190 PRINT:PRINT:PRINT"UNLESS..."
:PRINT:PRINT:PRINT:PRINT"WE RUN
OUT OF GAS !!!!!!!!"
200 PLAY"L1;FDE;T3;FDE;T1;DFC;"
210 PLAY"FGC;T2;C;T7;P1;D;P1;D;P
1;T1;D;T5;L16;C;O1;BAGFEDC"
220 CLS:PRINT"THE UNEXPLORED CAV
E WAS WRITTEN AND PREPARED FOR P
UBLICATION BY GIP WAYNE PLASTER.
"
230 PRINT" GOOD-BYE !"
```

Listen to What They Done

16K
ECB

By Lyn Arko

Musical arrangements frequently change key from verse to verse (the melody is the same but played higher or lower). This is a nice effect, but if you try to program it you must create new `PLAY` strings for every key change rather than repeat the original strings. Load and run *MusicPro* to hear "Look What They Done to my Song," which has a key change.

MusicPro uses musical numbers to create both strings from the same data. Note numbers are listed as `DATA` in lines 160 through 220. Lines 230 through 290 arrange the data into musical phrases and, on return from the subroutine, define the strings created by the subroutine. The subroutine at Line 330 reads the data and creates `PLAY` strings.

Line 330 clears previous strings, and Line 340 creates `J$` in the original key. Line 350 prints a "countdown" on the title screen while the subroutine is working. Line 360 tells the computer that length, octave, pause, tempo and volume data remain the same. Line 370 adds 3 to each note number, and Line 380 deletes the leading spaces left by `STR$(Y)` and changes the octave as necessary. Line 390 creates `K$` in a higher key.

You can adapt *MusicPro* for your own songs, but there are a few things you must look out for. The `3` in the `+3` in Line 370 can be any number from 1 to 12. Anything greater than 12 may put you in an octave out of CoCo's range, giving you an FC Error (illegal function call). You might also get this error if you use `O5` in your original `DATA` statements.

To change an octave, Line 380 uses `0+` (up one octave) and `0-` (down one octave) and may generate an LS Error (string too long). If this happens, put the data in two musical phrases rather than one.

The listing: `MUSICPRO`

```
10 CLEAR10000
20 DIM B$(15),P$(15)
30 CLS:Z$="    "+STRING$(23,42):
PRINT@128,Z$:PRINT"    * WHAT HA
VE THEY DONE *         * TO MY
 SONG, MA     *":PRINTTAB(4)"*";T
AB(26)"*":PRINT"    * WORDS AND
MUSIC  BY *":PRINTTAB(4)"*";TAB(
26)"*":PRINT"    *    MELANIE SA
FKA       *":PRINTZ$
40 PRINT@476,"8"
50 B$(1)="LOOK WHAT THEY DONE "
60 A$(1)="TO MY SONG":A$(2)=" MA
":B$(2)=A$(1)+A$(2)
70 B$(3)=B$(1)+A$(1)
80 B$(4)="WELL ITS THE ONLY THIN
G"
90 B$(5)="THAT I COULD DO HALF R
IGHT"
100 B$(6)="AND ITS TURNIN OUT AL
L WRONG"+A$(2)
110 B$(7)=B$(3):B$(8)=CHR$(13)+B
$(1):B$(9)=B$(2):B$(10)=B$(3)
120 B$(11)="WELL THEY TIED IT UP
"
130 B$(12)="IN A PLASTIC BAG"
140 B$(13)="AND TURNED IT UPSIDE
 DOWN"+A$(2)
150 B$(14)=B$(3)
160 DATA T5,O2,P4,L4,10,9,10,O3,
L2,1
170 DATA O2,L4,9,10,L1,6,3
180 DATA O3,P4,L4,3,2,3,L2,6,L4,
2,3,O2,L1.,11
190 DATA P8,P8,L8,6,8,6,L4,10,L8
,9,L4,10
200 DATA L8,9,10,6,L4,8,8,L8,10
210 DATA L8,3,L4,3,6,L4,6,8,10,L
2,6,3
220 DATA P4,L4,10,9,10,O3,L2,1,O
2,L4,8,10,L1,6
230 V=1:W=10:GOSUB330:P$(1)=J$:P
```

```
$(8)=K$
240 V=11:W=17:GOSUB330:P$(2)=J$:
P$(9)=K$
250 V=18:W=31:GOSUB330:P$(3)=J$:
P$(10)=K$
260 V=32:W=43:GOSUB330:P$(4)=J$:
P$(11)=K$
270 V=44:W=52:GOSUB330:P$(5)=J$:
P$(12)=K$
280 V=53:W=64:GOSUB330:P$(6)=J$:
P$(13)=K$
290 V=65:W=78:GOSUB330:P$(7)=J$:
P$(14)=K$
300 CLS:PRINT@480,;:FORP=1TO14:P
RINT:PRINTB$(P);:PLAYP$(P):NEXTP
:PRINT
310 PRINT@485,"<ENTER> TO PLAY A
GAIN";
320 I$=INKEY$:IFI$=""THEN320ELSE
IFI$=CHR$(13)THEN300ELSEEND
330 J$="":K$=""
340 FORX=V TO W:READX$:J$=J$+";"
+X$
350 R=X/10:IFINT(X/10)=R THENPRI
NT@475,(8-R):IF8-R=0THENPRINT@47
5," "
360 Q=ASC(X$):IFQ=76ORQ=79ORQ=80
ORQ=84ORQ=86THEN390
370 Y=VAL(X$)+3:IFY>12THENY=Y-12
:Z=1
380 X$=STR$(Y):L=LEN(X$):X$=RIGH
T$(X$,L-1):IFZ=1THENX$="O+;"+X$+
";O-":Z=0
390 K$=K$+";"+X$:NEXTX:RETURN
```

Games

Lotsa Luck!

16K
ECB

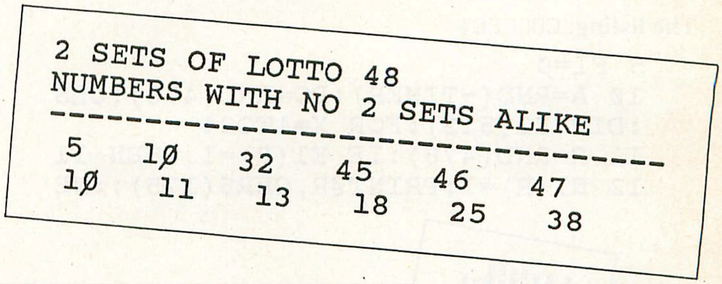
By Bob Nevin

Lotto 48 is for people who like to take chances on lotteries and have given up on the scientific methods of choosing numbers (consulting the arrangement of the planets, the fall of tea leaves and birthdays, etc.). Now your CoCo will pick them for you!

This program uses PLAY commands to supply music, but you can easily omit them if you don't have Extended Color BASIC. Also, if you have a printer, you can print out your results.

The listing: LOTTO48

```
10 ' THE 48 CAN BE CHANGED TO AN
Y OTHER NUMBER AS WELL AS THE 2
FOR THE SETS.
20 INPUT"DO YOU HAVE EXTENDED CO
LOR BASIC(yES OR n0)";E$:IF E$="
Y" THEN GOTO        30 ELSE GOTO
60
30 PRINT "LOTTO 48 MUSIC IS 'WIT
H A LITTLE BIT OF LUCK' FROM 'MY
 FAIR LADY' IF YOU SING ALONG, T
HE CHANCES OF WINNING ARE MUCH G
REATER!"
40 PRINT "THE WORDS FOR THE SONG
 ARE AS FOLLOWS. --> 'with a lit
-tle bit-----with a lit-tle bit-
----with a lit-tle bit of bloom-
ing luck'"
50 PLAY "L4.;E;L8;D#;E;D;L4;D;P2
;L4.;D;L8;C#;D;C;L4;C;P2;L4.;C;L
8;D;L4;E;C;E;C;L2;D;D;L2.;C"
```



```
2 SETS OF LOTTO 48
NUMBERS WITH NO 2 SETS ALIKE
--------------------------------
 5   10   32   45   46   47
10   11   13   18   25   38
```

```
60 CLS:INPUT"sCREEN OR pRINTER";
SP$
70 IF SP$="S"THEN Q=0:GOTO 100
80 IF SP$="P"THEN Q=-2:GOTO 100
90 GOTO 60
100 CLS:PRINT#Q,"2 SETS OF LOTTO
 48":PRINT#Q,"NUMBERS WITH NO 2
SETS ALIKE":PRINT#Q,STRING$(32,"
-")
110 FOR Z=1 TO 2
120 FOR X=1 TO 6
130 A=RND(48)
140 A1(X)=A
150 IF X=1 THEN 190
160 FOR C=1 TO X-1
170 IF A1(X)=A1(C) THEN 130
180 NEXT C
190 NEXT X
200 FOR X=1 TO 48
210 FOR C=1 TO 6
220 IF A1(C)=X THEN PRINT#Q,A1(C
);" ";
230 NEXT C,X
240 PRINT#Q," "
250 NEXT Z
260 PRINT@481,"aNOTHER SET OF NU
MBERS - qUIT";
270 A$=INKEY$:IFA$=""THEN270
```

```
280 IF A$="A"THEN100
290 IF A$="Q"THEN300
300 PRINT #Q,"          ========
=>IF THIS IS A WINNER, DON'T FOR
GET ME<=========";
310 CLS:PRINT#Q,"   ":PRINT #Q,"T
HIS PROGRAM WAS PREPARED ON THE
RADIO SHACK COLOR COMPUTER TRS-8
0 2 BY BOB NEVIN, 29-30 BELL BLV
D. BAYSIDE NEW YORK 11360. TEL.
 (718) 224-0728.        G O O D
 L U C K"
320 PRINT@294,"THANKS TO BILL BE
RNICO FOR HIS INVALUABLE ASSIST
ANCE."
330 PRINT@416,"=========>IF THIS
 IS A WINNER,        DON'T FORGET
ME<========";
```

Picking Up the Pieces

16K ECB

By Brian DeMarco

You've got to be quick in this game! You are a black box, and your goal is to collect all the blue boxes as quickly as possible. Use the arrow keys to scoot around the screen and gather them up, but remember that you're being timed.

Lines 5 through 15 set up variables and the screen. Lines 20 through 60 control your movement by checking to see if a key is pressed. Lines 70 and 80 check to see if you have touched a block and also if you have collected all the boxes. After you have cleared the screen, CoCo tells you how long it took you.

The listing: `COLLECT`

```
5 F1=0
10 A=RND(-TIMER):PO=RND(478):CLS
:DIM E1(512):FOR X=1TO24
11 R=RND(478):IF E1(R)=1 THEN 11
12 E1(R)=1:PRINT@R,CHR$(175);:NE
XTX
15 EN=24
20 IF PEEK(341)<>255 OR PEEK(342
)<>255 OR PEEK(343)<>255 OR PEEK
(344)<>255 THEN 25 ELSE F1=F1+1:
GOTO20
25 PRINT@PO,CHR$(32);
30 IF PEEK(342)<>255 AND PO<478
THEN PO=PO+32
40 IF PEEK(341)<>255 AND PO>31 T
HEN PO=PO-32
50 IF PEEK(343)<>255 AND PO>0 TH
EN PO=PO-1
60 IF PEEK(344)<>255 ANDPO<478 T
HEN PO=PO+1
70 PRINT@PO,CHR$(128);:IF E1(PO)
=1 THEN 80 ELSE F1=F1+1:GOTO20
80 E1(PO)=-1:EN=EN-1:F1=F1+1:IF
EN=0 THEN PRINT@480:PRINT"IT TOO
K";F1;"TURNS":FORX=1TO500:NEXTX:
RUN ELSE GOTO20
```

Utility

ASCII Answers

CoCo 3

By Bernice Shoobs

Programs are often written using the ASCII (decimal) counterparts of letters, numbers and other keyboard characters. With this program, you won't have to spend time referencing charts or typing `PRINT ASC(x)`.

The listing: `ASCIIREF`

```
10 REM ** PROGRAM TO DEMONSTRATE
**
20 REM ***** THE ASCII FUNCTION
******
30 REM
40 ON ERR GOTO 200
50 REM
60 WIDTH 40:LOCATE 0,0
70 PALETTE 8,0:PALETTE 0,63:CLS1
80 PRINT STRING$(40,"*")
90 LOCATE 5,2
100 PRINT"TYPE A WORD,PHRASE OR
NUMBERS"
110 PRINT STRING$(40,"*")
120 LINE INPUT C$
130 PRINT ""
140 FOR I=1 TO LEN(C$)
150 C=ASC (MID$(C$,I,1))
160 IFC<>32THEN PRINT USING "###
#";C;ELSEPRINT
170 NEXT I:PRINT
180 FOR T=1 TO 1000:NEXT
190 GOTO 100
200 PRINT "PLEASE, TRY AGAIN!"
210 FOR T= 1 TO 500:NEXT T
220 GOTO 100
```

Submissions to "Novices Niche" are welcome from everyone. We like to run a variety of short programs that can be typed in at one sitting and are useful, educational and fun. Keep in mind, although the short programs are limited in scope, many novice programmers find it enjoyable and quite educational to improve the software written by others.

Program submissions must be on tape or disk. We're sorry, but we cannot key in program listings. All programs should be supported by some editorial commentary, explaining how the program works. If your submission is accepted for publication, the payment rate will be established and agreed upon prior to publication.

CoCo Q&A CONSULTATIONS

By Marty Goodman
Rainbow Contributing Editor

In this and in future "CoCo Consultations," I will be trying something new. In addition to the familiar Q & A column, I will also include tidbits of information contributed by various folks and, in some cases, comment on the information. Thus, even if you don't have a question, *I invite you to send in any little hints or descriptions of experiences you have had with the CoCo that you think might be of interest to the CoCo-owning public in general.*

CoCo Hard Drive

How can I use an IBM-type hard drive on a CoCo?

Thomas E. Montgomery
(TOMMONT)
Spring, TX

Two RAINBOW advertisers, Owl-Ware and Burke & Burke, sell systems for hooking standard bare hard drives (like those used in IBM PCs) to Color Computers. These systems include host adapter, hard drive controller, and software to run the drive under OS-9 and — to a limited extent — under Disk BASIC, too. However, you will have to know quite a bit about hardware and software to get such a "do-it-yourself" system running; such systems are primarily of use only under OS-9 Level II. Among other things, you will have to build or supply a case and power supply for the drive. Such drives use considerably more power than floppy drives, so a floppy drive case and power supply will not do! Both of the aforementioned companies, as well as RGB Computer Systems, sell complete working systems. RGB points out that its system was specifically developed to allow maximum compatibility with OS-9 and Disk BASIC. Burke & Burke says its system also offers considerable compatibility with Disk BASIC.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

EPROM Availability

I observed that Motorola is discontinuing production of the 68766 EPROM. I would like to know of a source for this part in quantities under 100.

Roger Krupski
(HARDWAREHACK)
Kenmore, NY

Microware Exceltek, located in San Francisco, was selling the 68766 EPROM for about $10 a chip the last time I checked. Its phone numbers are (415) 952-5375 and (415) 588-7541.

Impractical Upgrade

Is there any low-cost way of upgrading my CoCo 2 with 64K to 128K without spending more than I originally paid for my CoCo?

Eric Beck
Akron, OH

Generally speaking, now that the CoCo 3 is out, the answer is no. It makes little sense to tack more memory onto a CoCo 2 since almost no commercial software will take advantage of such extra memory. It is true that J&R Systems has a proven 256K and 512K memory upgrade for the CoCo 2, but you are probably better off buying a CoCo 3 if you want more memory. And even on a CoCo 3, Disk BASIC does not allow use of more than 30K. J&R Systems is one of several companies that also sell a 512K upgrade board for the CoCo 3, and its board (like that of Performance Peripherals, Disto and others) is of good quality. If you want more memory, I would suggest that a CoCo 3 is the way to go, but only if you are prepared to get involved with OS-9 or commercial application programs that utilize the extra memory.

Trading Files

How can I hook my CoCo 3 to my Tandy 1000 so that I can exchange files between them? Do I need to use modems on both the CoCo and the Tandy 1000, or is there another way to do this that directly connects the serial ports to each other? I use DeskMate *on both the CoCo and the Tandy 1000. My computers are 60 feet apart.*

Carl F. Rusher
Fordland, MO

The right way to handle the *hardware* part of what you want to do (trade files between computers) is to hook the serial ports of both computers to each other using a null modem cable. If you are taking out the "bit-banger" (four-pin DIN) serial connector on the CoCo, then make up a cable in the following way:

Male 4 pin DIN (to CoCo)	DB 25 (to Tandy 1000)
3 (ground)	7 (ground)
2 (data in to CoCo)	2 (data from Tandy 1000
4 (data from CoCo)	3 (data to Tandy 1000)

Then connect pins 4 and 5 of the DB connector to each other, and connect pins 6, 8 and 20 to each other. Finally, connect a wire from Pin 1 of the CoCo DIN connector to the *jumper* that connects pins 8, 6 and 20 on the DB his cable can also be used 2SP pack. using an RS-232 pack, then ull modem cable as follows:

RS-232 pak serial port DB 25 connector	Tandy 1000 serial port DB 25 connector
2	3
3	2
7	7

Then, on *both* ends, hook Pin 4 to Pin 5, and pins 6, 8 and 20 to each other. There is no need to run more than three wires, however, between the computers themselves.

Sixty feet is more than the books say is proper for sending such serial data signals, but I doubt if you will have any trouble. I routinely send serial data between computers in my house using similar null modem cables at 9600 baud over as much as 60 feet of cable with no problems at all. I do use heavy duty cable with 22-gauge wire, however.

There is also a software side to the problem. When transferring files rapidly at high baud rates, it is essential to use Xmodem file transfer protocol. *DeskMate*'s terminal program is quite primitive. Some versions of *DeskMate* do not even support Xmodem at all. Instead of using *DeskMate* on both computers, you might consider switching to *ProComm* on your Tandy 1000 (this program is available as shareware for $10 from Datastorm Technologies, Inc., P.O. Box 1471, Columbia, MO 65205). I would also recommend switching to *MikeyTerm*, *Greg-E-Term* or *Rickyterm* on your CoCo 3. All three of those programs support Xmodem quite nicely and can be obtained for $10 each from their authors (Mike Ward, 1807 Cortez, Coral Gables, FL 33134; Greg Miller, 9575 Royston Road, Grand Ledge, MI 48837; and Rick Adams, 712 Brett Ave, Rohonert Park, CA 94928).

Disappointing Image

The image I get from my CoCo 3 on my Magnavox 8CM515 monitor is superbly clear when I use RGB. But when I try to use the composite video output of the CoCo 3 into the composite video input of the same Magnavox, the image is unusually poor. I tried the Magnavox with a VCR using composite video, and it produced a much *better image than it did on composite video with the CoCo 3. What is going on here?*

Also, my Smith Corona SD275 typewriter has a nine-pin serial connector on the back. The manual says you can hook up a computer to this typewriter to make it a printer, but you need an interface box sold by Smith Corona. Can I hook this nine-pin serial port directly to my CoCo 3?

Ray Jungmann
Buckholts, TX

To answer your first question, you have discovered what others have found — that the composite video signal coming out of the CoCo 3 is very poor. This is due to fundamentally bad hardware design in the CoCo 3. I currently know of no fix for this flaw, although some hardware hackers I know have suggested that using higher quality transistors in the composite video buffer circuit of the CoCo 3 might improve matters. It is also possible that the flaw lies within the GIME chip.

As to your second question, without extensive technical documentation on that nine-pin serial port, there is no way I can tell if you can hook it to a CoCo. I would guess not, though. Those ports often use weird, special signal levels and/or protocols that are quite different from those of RS-232 standard. Worse, the adapter devices are usually priced from $100 to $150. For that price you can buy a decent near letter-quality dot matrix printer. I have also seen high-quality, serial daisy wheel printers in that price range at computer swap meets in my area.

RTTY Upgrade

I use your RTTY *program with a Drake TR7. I want to send its output to a printer. How can I do this? How can I operate it at different wpm rates? Are you working on a packet radio program?*

James N. Tobey
(N9DYN)
Rochester, NY

An upgrade of the old *RTTY* program is available on the Delphi CoCo SIG in the Data Communications section of the database. With this program, you can receive RTTY data, save it to disk, then later load that file into your favorite CoCo word processor, format it as you like, and print it out. The program offers operation at four wpm rates. For those who don't have access to Delphi I will be glad to supply a copy of the new *RTTY* program if you send me a check or money order for $10, along with a stamped, self-addressed disk mailer with a disk enclosed. The program *is* public domain, and you are invited to give it away to others once you receive a copy. You can reach me at 1633 Bayo Vista Ave, San Pablo, CA 94806. This new RTTY program is an upgrade of the one by the same authors (N6LQV and KB6IRQ) who produced *WEFAX* and *Graphicom*. There are no plans by those folks to support packet radio on the CoCo at this time.

Missing Characters

I've been using the Mterm *4.3 with an Avatex 1200HC modem and RS-232 pack. I find characters are being dropped when I read forum messages non-stop into the buffer. Is this a sign that the 6551 in the pack needs to be replaced with a 6551A, as you recommended on the OS-9 SIG for a similar problem?*

Jay Browning
(ZARATHUSTRA)
Savannah, GA

No, I don't think the problem is a "slow 6551." You see, in all versions prior to the *MikeyTerm* 4.3, the CoCo 3 is running *only* at slow (.87) MHz. At no time is it being run at "double speed," so an ordinary 6551 chip should do fine.

It is possible that your 6551 is defective; more likely, some communications parameters are not set correctly. Be sure that both *MikeyTerm* and Delphi are set up for XON/XOFF control. *MikeyTerm* should function smoothly at 1200 baud and not miss any characters.

Note that had you been using the pack under OS-9 Level II, I *would* have suspected you might benefit from a 6551A chip, as also might have been the case had you been using *MikeyTerm* 4.7 at 2400 baud.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Questions can also be sent to Marty through the Delphi CoCo SIG. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then, at the RAINBOW> prompt, type `ASK` (for Ask the Experts) to arrive at the EXPERTS> prompt, where you can select the "CoCo Consultations" online form which has complete instructions.

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16K ECB

A program to sharpen library reference skills

Who, What and Where?

By Steve Blyn
Rainbow Contributing Editor

This month's article is about THE RAINBOW itself. The program, *Using the Parts of a Magazine*, is really a language arts skills lesson, but I won't tell if you won't!

A professional magazine such as THE RAINBOW has many parts that appear regularly each month. These include the Table of Contents, the Advertisers Index and the list of Racksellers (stores that sell the magazine), as well as various subscription forms, etc. We will concern ourselves with locating information from these sources.

This program presents the student with questions that may be answered in the regularly appearing sections of the magazine. The student's task is to locate and type in the information asked for. The quiz format is a fill-in.

It is sometimes difficult to know on a fill-in quiz such as this one exactly which answer the designer of the program is seeking. For example, in response to the question, "Who owns THE RAINBOW?" the acceptable answers might be: (1) Falk (2) Lonnie Falk or (3) Lawrence Falk. We, however, want to limit the answer to only one response. In this case, we would like the answer to be only Lonnie Falk. To encourage this, we have included a dash feature. Under the place for the student's response to each question, a series of dashes appear. These correspond to the correct number of characters in the answer.

This program contains 15 questions and answers contained in the `DATA` lines. These questions were chosen as examples of possible questions. Dozens of other questions could be added to the program. The counter for these questions is the variable `N` on Line 30. If you choose to add questions, simply update the `N` value and proceed to add more questions.

Lines 30 through 50 dimension and read the questions and answers contained in the `DATA` lines. Lines 70 through 140 draw our screen. Line 160 prints the question. The routine in lines 170 through 180 computes and prints the proper number of dashes in the answer. Line 190 accepts the student's answer. Lines 200 through 220 process the answer and inform the student whether or not the answer was correct.

The question is randomly selected in each round in Line 60. This is represented by variable `R`. Variable `M` in Line 130 is the round counter, and variable `C` in Line 140 is the counter for the number of correct answers. These are always updated and printed on the screen at the beginning of each round. After each question is answered, the student may press either the letter G to go on to the next question or the letter E to end the program.

No final score card is included in this program as we assume that all of the questions and answers will be either learned quickly or memorized. We are really hoping that the adult helping the user of this program will stress using the parts of the magazine rather than the particular answers in the program. The adult can verbally make up many questions for each of the topic ideas (such as Table of Contents) used in the program.

The time between the writing and the publication of this article precluded the inclusion of any specific questions about this month's issue. The program becomes more interesting and useful if you add such questions as:

- What page(s) is the Delphi Bureau article on this month? (Table of Contents)
- Where is CoCo Cat in this issue? (skimming skills)
- Who has the highest current score in the *Dallas Quest* game? (on the RAINBOW Scoreboard)
- What month is this issue for? (see cover)
- How many pages are in this issue?

Adding your own questions such as these makes for a more interesting program. Your child or students may also help to think of additional questions. Children always appreciate and therefore learn well when they are included in the designing of the program used. As always, the Computer Island staff hopes that you and your children enjoy these programs. ☐

Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.

The listing: `MAGPARTS`

```
10 REM"USING THE PARTS OF A MAGA
ZINE"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,STATEN ISLAND,NY,1988"
30 N=15:R=RND(N)
40 DIM A$(N),B$(N)
50 FOR T=1 TO N:READ A$(T),B$(T)
:NEXT T
60 CLS5:M=M+1:R=R+1:IF R=N THEN
R=1
70 FOR H=14 TO 27:SET(H,3,7):NEX
T H
80 FOR H=14 TO 27:SET(H,16,7):NE
XT H
90 FOR J=3 TO 16:SET(13,J,7):NEX
T J
100 FOR J= 3 TO 16:SET(28,J,7):N
EXT J
```

```
110 FOR H=15 TO 26:FOR J=7 TO 15
:SET(H,J,V):V=RND(8):NEXT J,H
120 PRINT@71,"RAINBOW";
130 PRINT@118,"#";M;
140 PRINT@182,"R";C;
150 PRINT@288," "
160 PRINT@288,A$(R)
170 W=LEN(B$(R))
180 PRINT@384,STRING$(W,"-")
190 PRINT@352,"";:LINEINPUT C$
200 IF C$=B$(R) THEN PRINT@372,"
CORRECT";:C=C+1:GOTO 230
210 IF C$<>B$(R) THEN PRINT@372,
"SORRY "
220 PRINT@416,B$(R);" IS THE ANS
WER"
230 PRINT@487,"PRESS 'G' OR 'E'"
;
240 EN$=INKEY$
250 IF EN$="G" THEN 60 ELSE IF E
N$="E" THEN CLS:END:ELSE 240
260 GOTO 260
270 DATA WHO WRITES THE BASIC TR
AINING  ARTICLE EACH MONTH?,JOS
EPH KOLAR
280 DATA WHO IS THE MANAGING EDI
TOR?,JUTTA KAPFHAMMAR
290 DATA WHAT IS THE NAME OF THE
 BULLETINBOARD THE RAINBOW USES?
,DELPHI
300 DATA HOW OFTEN IS RAINBOW PU
BLISHED?,MONTHLY
310 DATA IN WHICH CITY IS THE RA
INBOW   PUBLISHED?,PROSPECT
320 DATA HOW MUCH IS A SINGLE CO
PY OF THERAINBOW MAGAZINE?,$3.95
330 DATA HOW MUCH DOES A YEARLY
MAGAZINE SUBSCRIPTION COST?,$31.
00
340 DATA HOW MUCH IS RAINBOW ON
DISK FOR ONE YEAR?,$99.00
350 DATA HOW MUCH IS ONE ISSUE O
F THE    RAINBOW ON TAPE?,$10.00
360 DATA ON WHAT PAGE IS THE ADV
ERTISERS INDEX?,192
370 DATA WHAT STORE IN ATLANTA-G
EORGIA   SELLS THE RAINBOW?,BORD
ER'S
380 DATA WHAT STORE IN DESOTO-TE
XAS SELLSTHE RAINBOW?,MAXWELL BO
OKS
390 DATA WHICH EDITOR IS IN CHAR
GE OF THEREVIEWS?,JUDI HUTCHINSO
N
400 DATA WHO WRITES ARTICLES ABO
UT THE   DELPHI?,CRAY AUGSBURG
410 DATA WHO OWNS THE RAINBOW?,L
ONNIE FALK
420 DATA IN WHICH STATE IS THE T
OWN OF   PROSPECT?,KENTUCKY
```

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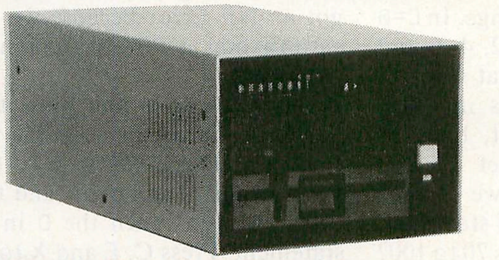

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More adventures with beginning graphics

Wading out of the Swamp

By Joseph Kolar
Rainbow Contributing Editor

What a happy rut we are in! We are having lots of colorful fun as we veer off onto new and promising paths in our Super Extended Lesson Two.

Load RACE, the last program we created before we waded out of the swamp to recharge our batteries. From lines 70 to 140, edit each line to change the value in STEP from 2 to 1. Run. This suggests doing the same to lines 230 through 260. Run. This maneuver prompts us to change the border color in lines 230 to 260. Run. The FC Error means that we must restore Line 66, which tells CoCo to recycle the color sequence if the color variable gets out of range.

Add this line: `66 IF C+1=9 THEN C=1` and run. This suggests making the second and fourth border into light bulbs. Edit lines 110 to 140, STEP 1 to STEP 2 and STEP-1 to STEP-2. Edit lines 150 to 180, reversing the procedure to change the light bulbs to a neon sign. Run.

Feel free to save any variation as you work along. This is an important rule. You can use each of the saved programs as a jumping-off point to splash around uncharted swamp waters and explore new areas.

Rekey Line 0 as `0 'RACE1` and save it. Suppose we REM the four lines, 150 to 180, in the middle border; try it and run. It starts out poorly, with the sawtooth frame, but quickly recovers.

Two suggestions come to mind. First, mask lines 70 to 100 and run. We are hitting pay dirt, which leads to masking the inner row. Mask lines 230 to 260 and run. I like it! I like it!

How quickly my mind bounces from one idea to the next. I forgot that second suggestion. Maybe I can refresh my memory by stripping the remarks (') from lines 230 to 260 and running the program. Do so, if you are still with me. Notice also how minor, seemingly inconsequential one- and two-keystroke changes radically alter the programs.

If you forget an idea, another will come along and send you hurtling down a new trail. I must repeat: Save all your promising programs, especially when you are in hot pursuit of some will-o'-the-wisp.

Time to fool around with the colors. Enter and run:

```
65 FOR C=0 TO 7 STEP2
```

Enter EDIT65 and press the space bar until the cursor is on 4. Press C, enter 1 and run. This last seems better. What about the other colors?

Enter EDIT65 and press X to jump to the end of the line, enter `:FOR D=2 TO 8 STEP2` and run.

Note that in C=0 TO 7 STEP2, CoCo will call colors 0, 2, 4 and 6, never reaching 7, which is out of range. In C=0 TO 8 STEP2, CoCo calls 0, 2, 4, 6 and 8. These facts presuppose that some of the sloppy FOR/NEXT lines in RACE should be re-examined. But, back to variable colors that were set up and remain dormant. Suppose we change the color variable in the SET statement in the outer frame to D in lines 70 to 100? Also, unmask these masked lines.

Enter EDIT70. Press D (for Delete) and the space bar. Move the cursor to C, then press C and D. (Caution: Once you change the length of an in-process edited line, you can't line up on the top line. You must place the cursor above the character you would otherwise line up on.) Run. Now, carefully change lines 80 to 100, observing the cautionary note above; run.

This loop is still not operative. Why? Enter EDIT261 and press the space bar; move the cursor under C. Press I and D and then run. This variation is awfully slow-moving. What if we gave it a little push by unmasking and changing the C values to D values in lines 150 to 180, the middle border? Run. This is as slow as molasses, but the combinations of borders and colors and fairly random motion is pleasing. Enter `0 '<RACE2>`. I want a copy, so save RACE2.

What would happen if lines 150 to 180 were further altered so that each of these lines was in a nested loop? Enter EDIT150 and press X to move to the end. Use the left arrow key to backspace once; enter D,H and run. No-go on a number of counts; unless you want a long, dreary program, this path is abandoned.

Type EDIT150 and press X. Using the left arrow key, backspace three times; press H and enter. The line is restored and we are in business.

Why not try it out in the inner border? Let us examine it. Type LIST230-270. We could make a smaller nested loop. Change all C+1's to E, then insert E in the next part in each of lines 230 to 260. For instance: Enter EDIT230, type 25 and press the space bar to advance 25 spaces. Right on target! Enter 3D to delete three characters. Press I (for Insert), type E and press a shifted up arrow to get out of the Insert mode. Press X, backspace once, enter E,H and run. That single square looks cute. We got an NF Error because we have not established a FOR statement. Enter LIST-261.

Enter EDIT230 and press the space bar until the cursor is on the S in SET. Press I and type FOR D=2 TO 8 STEP2. Press a shifted up arrow and the space bar until you reach the D in the SET statement. Press C, E and X to move to the end of the line. Backspace three times, type E,H and press ENTER. Edit lines 240 to 260 similarly and run. This is slow and disconcerting. Still, it does have some charm.

Observe that the right side of the inner "circle" could be dropped two spaces from V=8 to V=10 in Line 240. This same adjustment is called for in Line 260.

Pretend that CoCo is the Li'l Ol'

Florida-based Joseph Kolar is a veteran writer and programmer who specializes in introducing beginners to the powers of the Color Computer.

Cursor scooting around the inner border. Enter `0 'RACE3` and save the program as `RACE3`. This is my Waterloo . . . a dead end. Enter `NEW`.

Load `RACE`. Correct lines 240 and 260, change the `V` values from 8 to 10 and run.

There is a long vertical segment at the fourth row from the left. It is some kind of oversight (a nice name for a mistake). For some reason that escapes me now, I was interrupted and when I returned to continue working on this tutorial, I got lost in the swamp. I loaded `RACE`, looked it over and didn't get any inspiration. Then I checked out `RACE1`; as I watched the action, I thought, "Why not select two or three colors that go well together?"

Off and running, with `RACE1` in memory, I entered and ran `65 FOR C=4 TO 6 STEP2`. This gave a 4th of July aspect, primarily due to the red, white and blue. Here is a quick problem: Insert `SCREEN0,1` into the program to turn the text orange. Did you get it on the first try? Well, I didn't either. After you put it in the program, run and remove it.

A similar red-white-blue version: Type `65 FOR C=3 TO 5` and run.

Now enter and run `10 CLS5`. This presents another problem to solve. Can you recover the missing parts of the design? It might be beneficial to know this. You never know when you can put this knowledge to good use.

You won't believe the display that uncovering this blemish produced. Instinctively, I deduced that Line 20 should be remarked, because the lack of blank screen lines must have been the reason for the lost light bulbs. Running this pulled the three-liner up to the top. Since it contained only five rows, it was completely obliterated and left a goofy, unsatisfactory design. Adding the line `25 PRINT@160,""` pulled the display back to its original location. The `PRINT@` statement was used to accomplish this feat. We simply told CoCo that on the text screen, beginning with the leftmost space on the sixth row, it should "print nothing." It did and activated the three-liner. When I ran it, the light bulb effect was lost and CoCo went bananas.

Still, the display must be considered unique. I never expected the result I obtained; this should prove to any skeptics that when you experiment, the unexpected is apt to occur. There is no way in the world that I would have created this display on purpose.

If you would like to put a couple of blank spaces within the quotes in Line 25, the results would be the same. Just make sure you confine the blank spaces to the sixth row. Enter `0 'ODDBALL` and `DEL270-370`. Save the program as `ODDBALL`.

Could you investigate this goofy program any further? You certainly could. There is no such animal as the final, definitive program. It is just that your mind is at rest.

Why not take out the light bulbs on each side of `ODDBALL`? Enter `LIST-150` and search out any `STEP+` or `-2`s. Mask lines 100 and 120 (you know these are the lines you are looking for because they run vertically) and run. Enter `LIST150-250`, mask lines 200 and 220 and run. The newly produced white side bars are of different lengths because of the convolution. Make them the same length. Adjust . . . but how?

We have to shorten the right, vertical line and set it to whatever color is currently produced. Enter and run these lines:

```
115 FOR H=60 TO 59 STEP-1:
SET(H,29,C):NEXTH
195 FOR H=57 TO 56 STEP-1:
SET(H,29,C):NEXTH
```

Why did we decide to shorten the right side bars? Mask lines 115 and 195 and run; you will understand. By shortening these two bars, a more symmetrical design is obtained. The resultant display isn't perfect, yet it is attractive. You may want to save this as `ODDBALL1`. If you do, change Line 0.

Purists must have been irritated at the haphazard use of the `FOR/NEXT` loops. The squares line up poorly. However, we were experimenting and exploring the dismal swamp. Consider the good stuff we were able to isolate, identify and create.

It is time to make the proper template for our designs and set them in concrete.

Enter `NEW` and key in lines 0 to 41 of listing `DOTZ`. Unmask lines 30 and 31; run. This is the way the light bulbs should look along the top row. Enter `LIST-41`; Line 30 gives the correct `H` (horizontal) and `V` (vertical) values. Unmask lines 40 and 41, mask Line 31 and run. Note that the square at `H=0;V=0` is a duplication. The yellow bulb is superimposed on the green bulb. In making convoluted designs, avoid overlapping bulbs to maintain continuity and uniformity. This is apparent when only a few bulbs are lit simultaneously in a short bulb row. Type `DEL30-41`, key in Line 50 and run. This is the template we shall use as a basis for making a triple frame convoluting into the center.

Key lines 60 to 81, one line at a time, and run each. Each line segment is in a different color to highlight the bulbs that are lit. If you copy the `SET` segments of the paired lines, 60 and 61, 70 and 71, 80 and 81, and place each set of four `SET` statements under each other, you will discover the offset you will need to utilize to get to the center of the screen. You may want to save this portion of `DOTZ` and later race the bulbs to the center.

Key in lines 100 to 115. We are creating a border that will skip along on an existing bulb track between the outer and inner borders, bypassing the middle border. Line 100 sets a color, yellow, so you can follow the length and direction of each line segment.

Note the three lit bulbs. We try to light as many bulbs in short lines as possible. For instance, depending on how we drew the horizontal and vertical lines, we could have either overlapping bulbs on the diagonal or just one or two bulbs lit. Our purpose is to avoid jerky, non-uniform, back-and-forth motions.

Since we have an underlying template, we can set three individual bulbs in Line 100. Note Line 110; we did not use `FOR H=0 TO 62`. This would have over-printed a bulb at 0,0 and 62,0 squares. This is a precautionary measure; at CoCo's rapid execution the eye might not catch the relit bulb, but who knows? Later we might slow down the presentation, and it would look disquietingly disjointed. The lines are paired: 110 and 115, 120 and 125, etc. (a straight segment and a diagonal one).

In Line 150, we change color to aid you in observing which boxes are lit. Notice that the four diagonal program lines are repeated (in the same direction).

They could have been put into `GOSUB` routines. This was not done to avoid confusing the newcomer. It isn't a big deal, but every bit of programming practice is good for your CoCo health. When you finish Line 185, save your work as `DOTZ`. Line 505 is a fossil. If we didn't recycle in Line 185 (`GOTO60`), then Line 505 would be alive and well.

To get `GOSUB` practice, enter and run these lines:

```
600 SET(4,4,C):SET(2,2,C):
SET(0,0,C):RETURN
100 C=2:GOSUB600
145 GOSUB600
```

Make similar routines at lines 700, 800 and 900 for the three other diagonal pairs and rekey the supported lines. Save your modification.

Mask Line 50 to remove our template. So, what do you think? Did you enjoy the catch-as-catch-can exploration or do you prefer the plodding, structured procedure? I believe in freeform. The more structured work you create, the less creative you become; in short order, your mind gets set in concrete.

Beginning with Line 60, edit out all occurrences of `C=×`, where × is some color from 1 to 8.

Edit lines 70 and 71, changing `STEP-2` and `STEP+2` to `STEP-1` and `STEP+1`. Edit Line 100 to insert at the beginning `FOR C=1 TO 8`. In Line 185, in front of `:GOTO60`, insert `:NEXTC` and run. This will poop out eventually in Line 60. Change the `GOTO60` in Line 185 to `GOTO100`. Run and save if desired.

This is an unfinished program. You are the boss; take over!

I suggest making two more convoluted frames for a total of five. The middle one could be one color, the second and fourth ones a second color. These three sandwiched frames could be neon signs. Add `SET` values in your `SET` line for the diagonal. Here is where those `GOSUB` routines become useful.

Then tighten up the three inner borders, linking them by adjusting values in the `FOR/NEXT` loops. Play with it and let your fantasy take over.

If you need a jolt to awaken your creative juices, change steps in lines 70 and 71 to 4 or 6 and run. Mask lines 70 and 71 and run. Further, change Line 10 to `CLS5` and run. Oh, you know what to do.

Next month, we shall use `RACE` to demonstrate its use in a real live educational program. ☐

Listing 1

```
0 '<RACE1>
10 CLS
20 FOR X=1 TO 5:PRINT:NEXTX
30 PRINTTAB(10)"DOCHITA D MAY"
40 PRINT
50 PRINTTAB(8)"510 HIGHLANDS AVE
"
60 PRINT:PRINTTAB(6)"INVERNESS,
FL, 32652
65 FOR C=1 TO 8
66 IF C+1=9 THEN C=1
70 FOR H=0 TO 63STEP1:SET(H,0,C)
:NEXTH
80 FOR V=0 TO 31STEP+1:SET(63,V,
C):NEXTV
90 FOR H=63 TO 0 STEP-1:SET(H,31
,C):NEXTH
100 FOR V=31 TO 2 STEP-1:SET(0,V
,C):NEXTV
110 FOR H=2 TO 61 STEP2:SET(H,2,
C):NEXTH
120 FOR V=2 TO 29 STEP2:SET(61,V
,C):NEXTV
130 FOR H=59 TO 2 STEP-2:SET(H,2
9,C):NEXTH
140 FOR V=27 TO 4 STEP-2:SET(2,V
,C):NEXTV
150 FOR H=4TO59 STEP1:SET(H,4,C)
:NEXTH
160 FOR V=4TO27 STEP1:SET(59,V,C
):NEXTV
170 FOR H=57 TO4STEP-1:SET(H,27,
C):NEXTH
180 FOR V=25 TO 6 STEP-1:SET(4,V
,C):NEXTV
190 FOR H=6TO57 STEP2:SET(H,6,C)
:NEXTH
200 FOR V=6TO25 STEP2:SET(57,V,C
):NEXTV
210 FOR H=55 TO 6 STEP-2:SET(H,2
5,C):NEXTH
220 FOR V=23 TO6 STEP-2:SET(6,V,
C):NEXTV
230 FOR H=8TO55STEP1:SET(H,8,C+1
):NEXTH
240 FOR V=8 TO23 STEP1:SET(55,V,
C+1):NEXTV
250 FOR H=53 TO8STEP-1:SET(H,23,
C+1):NEXTH
260 FOR V=21 TO 8STEP-1:SET(8,V,
C+1):NEXTV
261 NEXTC:GOTO65
270 FORH=10TO53STEP2:SET(H,10,C)
:NEXTH
280 FOR V=10 TO21STEP2:SET(53,V,
C):NEXTV
290 FOR H=51 TO10STEP-2:SET(H,21
,C):NEXTH
300 FOR V=19 TO 12STEP-2:SET(10,
V,C):NEXTV
310 FORH=12 TO51 STEP2:SET(H,12,
C):NEXTH
320 FOR V=12 TO19 STEP2:SET(51,V
,C):NEXTV
330 FORH=49 TO12 STEP-2:SET(H,19
,C):NEXTH
340 FOR V=17 TO14 STEP-2:SET(12,
V,C):NEXTV
350 FORH=14TO49STEP2:SET(H,14,C)
:NEXTH
360 SET(49,16,C)
370 FOR H=47 TO14STEP-2:SET(H,16
,C):NEXTH
400 NEXTC
410 GOTO410
```

Listing 2

```
0 '<RACE2>
10 CLS
20 FOR X=1 TO 5:PRINT:NEXTX
30 PRINTTAB(10)"DOCHITA D MAY"
40 PRINT
50 PRINTTAB(8)"510 HIGHLANDS AVE
"
60 PRINT:PRINTTAB(6)"INVERNESS,
FL, 32652
65 FOR C=1 TO 7 STEP2:FORD=2 TO
8 STEP2
66 IF C+1=9 THEN C=1
70 FOR H=0 TO 63STEP1:SET(H,0,D)
:NEXTH
80 FOR V=0 TO 31STEP+1:SET(63,V,
D):NEXTV
90 FOR H=63 TO 0 STEP-1:SET(H,31
,D):NEXTH
100 FOR V=31 TO 2 STEP-1:SET(0,V
,D):NEXTV
110 FOR H=2 TO 61 STEP2:SET(H,2,
C):NEXTH
120 FOR V=2 TO 29 STEP2:SET(61,V
,C):NEXTV
130 FOR H=59 TO 2 STEP-2:SET(H,2
9,C):NEXTH
140 FOR V=27 TO 4 STEP-2:SET(2,V
,C):NEXTV
150 FOR H=4TO59 STEP1:SET(H,4,D)
:NEXTH
160 FOR V=4TO27 STEP1:SET(59,V,D
):NEXTV
170 FOR H=57 TO4STEP-1:SET(H,27,
D):NEXTH
180 FOR V=25 TO 6 STEP-1:SET(4,V
,D):NEXTV
190 FOR H=6TO57 STEP2:SET(H,6,C)
:NEXTH
200 FOR V=6TO25 STEP2:SET(57,V,C
):NEXTV
210 FOR H=55 TO 6 STEP-2:SET(H,2
5,C):NEXTH
220 FOR V=23 TO6 STEP-2:SET(6,V,
C):NEXTV
230 FOR H=8TO55STEP1:SET(H,8,C+1
):NEXTH
240 FOR V=8 TO23 STEP1:SET(55,V,
C+1):NEXTV
250 FOR H=53 TO8STEP-1:SET(H,23,
C+1):NEXTH
260 FOR V=21 TO 8STEP-1:SET(8,V,
C+1):NEXTV
261 NEXTD,C:GOTO65
270 FORH=10TO53STEP2:SET(H,10,C)
:NEXTH
280 FOR V=10 TO21STEP2:SET(53,V,
C):NEXTV
290 FOR H=51 TO10STEP-2:SET(H,21
,C):NEXTH
300 FOR V=19 TO 12STEP-2:SET(10,
V,C):NEXTV
310 FORH=12 TO51 STEP2:SET(H,12,
C):NEXTH
320 FOR V=12 TO19 STEP2:SET(51,V
,C):NEXTV
330 FORH=49 TO12 STEP-2:SET(H,19
```

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```
,C):NEXTH
340 FOR V=17 TO14 STEP-2:SET(12,
V,C):NEXTV
350 FORH=14TO49STEP2:SET(H,14,C)
:NEXTH
360 SET(49,16,C)
370 FOR H=47 TO14STEP-2:SET(H,16
,C):NEXTH
400 NEXTC
410 GOTO410
```

Listing 3

```
0 '<RACE3>
10 CLS
20 FOR X=1 TO 5:PRINT:NEXTX
30 PRINTTAB(10)"DOCHITA D MAY"
40 PRINT
50 PRINTTAB(8)"510 HIGHLANDS AVE
"
60 PRINT:PRINTTAB(6)"INVERNESS,
FL, 32652
65 FOR C=1 TO 7 STEP2:FORD=2 TO
8 STEP2
66 IF C+1=9 THEN C=1
70 FOR H=0 TO 63STEP1:SET(H,0,D)
:NEXTH
80 FOR V=0 TO 31STEP+1:SET(63,V,
D):NEXTV
90 FOR H=63 TO 0 STEP-1:SET(H,31
,D):NEXTH
100 FOR V=31 TO 2 STEP-1:SET(0,V
,D):NEXTV
110 FOR H=2 TO 61 STEP2:SET(H,2,
C):NEXTH
120 FOR V=2 TO 29 STEP2:SET(61,V
,C):NEXTV
130 FOR H=59 TO 2 STEP-2:SET(H,2
9,C):NEXTH
140 FOR V=27 TO 4 STEP-2:SET(2,V
,C):NEXTV
150 FOR H=4TO59 STEP1:SET(H,4,D)
:NEXTH
160 FOR V=4TO27 STEP1:SET(59,V,D
):NEXTV
170 FOR H=57 TO4STEP-1:SET(H,27,
D):NEXTH
180 FOR V=25 TO 6 STEP-1:SET(4,V
,D):NEXTV
190 FOR H=6TO57 STEP2:SET(H,6,C)
:NEXTH
200 FOR V=6TO25 STEP2:SET(57,V,C
):NEXTV
210 FOR H=55 TO 6 STEP-2:SET(H,2
5,C):NEXTH
220 FOR V=23 TO6 STEP-2:SET(6,V,
C):NEXTV
230 FOR H=8TO55STEP1:FORE=2 TO 4
 STEP2:SET(H,8,E):NEXTE,H
240 FOR V=10 TO23 STEP1:FORE=2TO
8STEP2:SET(55,V,E):NEXTE,V
250 FOR H=53 TO8STEP-1:FORE=2TO8
STEP2:SET(H,23,E):NEXTE,H
260 FOR V=21 TO10STEP-1:FORE=2TO
8STEP2:SET(8,V,E):NEXTE,V
261 NEXTD,C:GOTO65
270 FORH=10TO53STEP2:SET(H,10,C)
:NEXTH
280 FOR V=10 TO21STEP2:SET(53,V,
C):NEXTV
290 FOR H=51 TO10STEP-2:SET(H,21
,C):NEXTH
300 FOR V=19 TO 12STEP-2:SET(10,
V,C):NEXTV
310 FORH=12 TO51 STEP2:SET(H,12,
C):NEXTH
320 FOR V=12 TO19 STEP2:SET(51,V
,C):NEXTV
330 FORH=49 TO12 STEP-2:SET(H,19
,C):NEXTH
340 FOR V=17 TO14 STEP-2:SET(12,
V,C):NEXTV
350 FORH=14TO49STEP2:SET(H,14,C)
:NEXTH
360 SET(49,16,C)
370 FOR H=47 TO14STEP-2:SET(H,16
,C):NEXTH
400 NEXTC
410 GOTO410
```

Listing 4

```
0 '<ODDBALL>
10 CLS5
20 'FOR X=1 TO 5:PRINT:NEXTX
25 PRINT@160,"                  "
30 PRINTTAB(10)"DOCHITA D MAY"
40 PRINT
50 PRINTTAB(8)"510 HIGHLANDS AVE
"
60 PRINT:PRINTTAB(6)"INVERNESS,
FL, 32652
65 FOR C=3 TO 5
66 IF C+1=9 THEN C=1
70 FOR H=0 TO 63STEP1:SET(H,0,C)
:NEXTH
80 FOR V=0 TO 31STEP+1:SET(63,V,
C):NEXTV
90 FOR H=63 TO 0 STEP-1:SET(H,31
,C):NEXTH
100 FOR V=31 TO 2 STEP-1:SET(0,V
,C):NEXTV
110 FOR H=2 TO 61 STEP2:SET(H,2,
C):NEXTH
120 FOR V=2 TO 29 STEP2:SET(61,V
,C):NEXTV
130 FOR H=59 TO 2 STEP-2:SET(H,2
9,C):NEXTH
```

```
140 FOR V=27 TO 4 STEP-2:SET(2,V
,C):NEXTV
150 FOR H=4TO59 STEP1:SET(H,4,C)
:NEXTH
160 FOR V=4TO27 STEP1:SET(59,V,C
):NEXTV
170 FOR H=57 TO4STEP-1:SET(H,27,
C):NEXTH
180 FOR V=25 TO 6 STEP-1:SET(4,V
,C):NEXTV
190 FOR H=6TO57 STEP2:SET(H,6,C)
:NEXTH
200 FOR V=6TO25 STEP2:SET(57,V,C
):NEXTV
210 FOR H=55 TO 6 STEP-2:SET(H,2
5,C):NEXTH
220 FOR V=23 TO6 STEP-2:SET(6,V,
C):NEXTV
230 FOR H=8TO55STEP1:SET(H,8,C+1
):NEXTH
240 FOR V=8 TO23 STEP1:SET(55,V,
C+1):NEXTV
250 FOR H=53 TO8STEP-1:SET(H,23,
C+1):NEXTH
260 FOR V=21 TO 8STEP-1:SET(8,V,
C+1):NEXTV
261 NEXTC:GOTO65
400 NEXTC
410 GOTO410
```

Listing 5

```
0 '<ODDBALL1>
10 CLS5
20 'FOR X=1 TO 5:PRINT:NEXTX
25 PRINT@160,"    "
30 PRINTTAB(10)"DOCHITA D MAY"
40 PRINT
50 PRINTTAB(8)"510 HIGHLANDS AVE
"
60 PRINT:PRINTTAB(6)"INVERNESS,
FL, 32652
65 FOR C=3 TO 5
66 IF C+1=9 THEN C=1
70 FOR H=0 TO 63STEP1:SET(H,0,C)
:NEXTH
80 FOR V=0 TO 31STEP+1:SET(63,V,
C):NEXTV
90 FOR H=63 TO 0 STEP-1:SET(H,31
,C):NEXTH
100 FOR V=31 TO 2 STEP-1:SET(0,V
,C):NEXTV
110 FOR H=2 TO 61 STEP2:SET(H,2,
C):NEXTH
115 FOR H=60 TO 59 STEP-1:SET(H,
29,C):NEXTH
120 'FOR V=2 TO 29 STEP2:SET(61,
V,C):NEXTV
130 FOR H=59 TO 2 STEP-2:SET(H,2
9,C):NEXTH
140 'FOR V=27 TO 4 STEP-2:SET(2,
V,C):NEXTV
150 FOR H=4TO59 STEP1:SET(H,4,C)
:NEXTH
160 FOR V=4TO27 STEP1:SET(59,V,C
):NEXTV
170 FOR H=57 TO4STEP-1:SET(H,27,
C):NEXTH
180 FOR V=25 TO 6 STEP-1:SET(4,V
,C):NEXTV
190 FOR H=6TO57 STEP2:SET(H,6,C)
:NEXTH
195 FOR H=57 TO 56 STEP-1:SET(H,
25,C):NEXTH
200 'FOR V=6TO25 STEP2:SET(57,V,
C):NEXTV
210 FOR H=55 TO 6 STEP-2:SET(H,2
5,C):NEXTH
220 'FOR V=23 TO6 STEP-2:SET(6,V
,C):NEXTV
230 FOR H=8TO55STEP1:SET(H,8,C+1
):NEXTH
240 FOR V=8 TO23 STEP1:SET(55,V,
C+1):NEXTV
250 FOR H=53 TO8STEP-1:SET(H,23,
C+1):NEXTH
260 FOR V=21 TO 8STEP-1:SET(8,V,
C+1):NEXTV
261 NEXTC:GOTO65
400 NEXTC
410 GOTO410
```

Listing 6

```
0 '<DOTZ>
10 CLS0
20 C=1
30 'FOR H=0TO62 STEP2:SET(H,0,C)
:NEXTH
31 'GOTO31
40 'FOR V=0TO30 STEP2:SET(0,V,C+
1):NEXTV
41 'GOTO41
50 FOR H=0TO62STEP2:FORV=0TO30ST
EP2:SET(H,V,C):NEXTV,H
```

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```
60 C=5:FOR H=0TO62 STEP2:SET(H,0
,C):NEXTH:C=6:FORV=2TO30 STEP2:S
ET(62,V,C):NEXTV
61 C=8:FORH=60 TO0STEP-2:SET(H,3
0,C):NEXTH:C=7:FORV=28 TO 2 STEP
-2:SET(0,V,C):NEXTV
70 C=3:FORH=2TO60 STEP2:SET(H,2,
C):NEXTH:C=2:FORV=4TO28 STEP2:SE
T(60,V,C):NEXTV
71 C=5:FORH=58TO2 STEP-2:SET(H,2
8,C):NEXTH:C=4:FORV=26TO4 STEP-2
:SET(2,V,C):NEXTV
80 C=6:FOR H=4TO58STEP2:SET(H,4,
C):NEXTH:C=7:FORV=6TO26 STEP2:SE
T(58,V,C):NEXTV
81 C=3:FORH=56TO4STEP-2:SET(H,26
,C):NEXTH:C=5:FORV=24TO6STEP-2:S
ET(4,V,C):NEXTV
100 C=2:SET(4,4,C):SET(2,2,C):SE
T(0,0,C)
110 FORH=2TO60 STEP2:SET(H,0,C):
NEXTH
115 SET(62,0,C):SET(60,2,C):SET(
58,4,C)
120 FORV=6TO24 STEP2:SET(58,V,C)
:NEXTV
125 SET(58,26,C):SET(60,28,C):SE
T(62,30,C)
130 FORH=60 TO2 STEP-2:SET(H,30,
C):NEXTH
135 SET(0,30,C):SET(2,28,C):SET(
4,26,C)
140 FORV=24TO6STEP-2:SET(4,V,C):
NEXTV
145 SET(4,4,C):SET(2,2,C):SET(0,
0,C)
150 C=6:FORV=2TO28 STEP2:SET(0,V
,C):NEXTV
155 SET(0,30,C):SET(2,28,C):SET(
4,26,C)
160 FORH=6TO56STEP2:SET(H,26,C):
NEXTH
165 SET(58,26,C):SET(60,28,C):SE
T(62,30,C)
170 FORV=28TO2STEP-2:SET(62,V,C)
:NEXTV
175 SET(62,0,C):SET(60,2,C):SET(
58,4,C)
180 FORH=56TO6STEP-2:SET(H,4,C):
NEXTH
185 SET(4,4,C):SET(2,2,C):SET(0,
0,C):GOTO60
505 GOTO505
```

Listing 7

```
 0 '<DOTZ1>
 10 CLS0
 20 C=1
 30 'FOR H=0TO62 STEP2:SET(H,0,C)
:NEXTH
31 'GOTO31
40 'FOR V=0TO30 STEP2:SET(0,V,C+
1):NEXTV
41 'GOTO41
50 'FOR H=0TO62STEP2:FORV=0TO30S
TEP2:SET(H,V,C):NEXTV,H
60 FOR H=0TO62 STEP2:SET(H,0,C):
NEXTH:FORV=2TO30 STEP2:SET(62,V,
C):NEXTV
61 FORH=60 TO0STEP-2:SET(H,30,C)
:NEXTH:FORV=28 TO 2 STEP-2:SET(0
,V,C):NEXTV
70 FORH=2TO60 STEP1:SET(H,2,C):N
EXTH:FORV=4TO28 STEP1:SET(60,V,C
):NEXTV
71 FORH=58TO2 STEP-1:SET(H,28,C)
:NEXTH:FORV=26TO4 STEP-1:SET(2,V
,C):NEXTV
80 FOR H=4TO58STEP2:SET(H,4,C):N
EXTH:FORV=6TO26 STEP2:SET(58,V,C
):NEXTV
81 FORH=56TO4STEP-2:SET(H,26,C):
NEXTH:FORV=24TO6STEP-2:SET(4,V,C
):NEXTV
100 FORC=1TO8:SET(4,4,C):SET(2,2
,C):SET(0,0,C)
110 FORH=2TO60 STEP2:SET(H,0,C):
NEXTH
115 SET(62,0,C):SET(60,2,C):SET(
58,4,C)
120 FORV=6TO24 STEP2:SET(58,V,C)
:NEXTV
125 SET(58,26,C):SET(60,28,C):SE
T(62,30,C)
130 FORH=60 TO2 STEP-2:SET(H,30,
C):NEXTH
135 SET(0,30,C):SET(2,28,C):SET(
4,26,C)
140 FORV=24TO6STEP-2:SET(4,V,C):
NEXTV
145 SET(4,4,C):SET(2,2,C):SET(0,
0,C)
150 FORV=2TO28 STEP2:SET(0,V,C):
NEXTV
155 SET(0,30,C):SET(2,28,C):SET(
4,26,C)
160 FORH=6TO56STEP2:SET(H,26,C):
NEXTH
165 SET(58,26,C):SET(60,28,C):SE
T(62,30,C)
170 FORV=28TO2STEP-2:SET(62,V,C)
:NEXTV
175 SET(62,0,C):SET(60,2,C):SET(
58,4,C)
180 FORH=56TO6STEP-2:SET(H,4,C):
NEXTH
185 SET(4,4,C):SET(2,2,C):SET(0,
0,C):NEXTC:GOTO100
505 GOTO505
```

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CoCo 3 16K ECB Mod.

A jukebox of ragtime selections

Blast From the Past

By Ernie Thompson

Ragtime recordings are very difficult to find. The sheet music is readily available, however, so there must be some demand.

In my program, *Jukebox*, I translated five songs from sheet music: "North Shore," "High Level Hornpipe," "Patronella," "Dill Pickle Rag" and "Black & White." Not all of them are rags, but they're all fast! Two of the ragtime selections, "Dill Pickle Rag" and "Black & White," are seldom heard because few pianists have proficiency enough to play them. CoCo doesn't have a problem keeping ahead of the fast licks, though.

A retired engineer and plant manager, Ernie Thompson has devoted himself to becoming a "sometime" programmer with the aid of his son Bob, also an engineer. Except for his time in the military, Ernie has always lived on the Canadian prairie; he makes his home in Moose Jaw, Saskatchewan.

Jukebox is menu-driven and very easy to use. After you type in, save and run the program, all you have to do is select the number of the song you want to hear. When the song has finished playing, you will be returned to the menu. All functions of this program are evoked with a single key press.

I wrote *Jukebox* for the CoCo 3, but it can easily be modified for operation on a CoCo 1 or 2 — just delete lines 5 and 70.

(Questions or comments about this program may be addressed to the author at 1209 5th Ave. N.W., Moose Jaw, SK, Canada S6H 3Y8. Please enclose an SASE when requesting a reply.) □

220	77	890	14
380	204	1030	25
560	255	END	50
690	254		

The listing: JUKEBOX

```
5 RGB
10 CLS:PRINT@166,"MUSICAL ARRANG
EMENTS"
20 PRINT@238,"BY"
30 PRINT@490," <any key>"
40 PRINT@297,"ERNIE THOMPSON"
45 PRINT@366,"1987"
50 EXEC44539
60 CLS
70 PALETTE13,1:PALETTE12,63
80 C=RND(8):CLS(C)
90 PRINTSTRING$(32,42);
```

```
100 FORX=1TO14
110 PRINT"*";:PRINTSTRING$(30,CH
R$(255));:PRINT"*";
120 NEXT
130 PRINTSTRING$(31,42);
140 POKE1535,106:POKE359,57:POKE
65314,20
150 PRINT@36,"**Favorite Fiddle
Tunes**";
160 PRINT @ 100, "1) NORTH SHORE
 BREAKDOWN";
170 PRINT @ 164, "2) HIGH LEVEL
HORNPIPE";
180 PRINT @ 228, "3) PATRONELLA"
;
190 PRINT @ 292, "4) DILL PICKLE
 RAG";
200 PRINT @ 356, "5) BLACK & WHI
TE RAG";
210 PRINT @ 426, "6) END JOB";
220 EXEC44539
230 AN$=INKEY$
240 IF AN$ ="" THEN 230
250 IF AN$ = "4"  THEN 270
260 FOR I=1 TO 40:NEXT I
270 ON VAL (AN$) GOTO 280,420,57
0,690,890,1220
280 C=RND(8)
290 CLS(C)
300 PRINTSTRING$(32,42)
310 PRINT@35, "*THE NORTH SHORE
BREAKDOWN*"
320 PRINTSTRING$(32,42)
330 A$="O3T2V15L8DDL16DO2ABO3C#L
8DDL16DO2ABO3C#DC#DEF#EDC#O2L8BG
GO3L16C#DL8EEL16EO2L16AO3C#D"
340 B$="O3L8EEL16EO2AO3C#DEF#EDC
#O2ABO3C#L8DF#DP8"
350 C$="O3L4.F#L16G"
360 D$="O3L16ABAF#L8DO2L16AO3DC#
O2BBBL8BO3L16EF#"
370 E$="O3L16GAGEL8C#L16O2AO3C#O
2BAAAL8AO3L16F#GABAF#L8DO2L16AO3
DC#O2BBBL8BO3L16EF#GAGEC#O2ABO3C
#L8DF#DP4"
380 X$="XA$;XB$;XA$;XB$;XC$;XD$;
XE$;XD$;XE$;XD$;XE$;XA$;XB$;XC$;
XD$;XE$;"
390 PLAY X$
400 PRINT@227, "OFTEN PLAYED AT
CONTESTS";
410 PRINT@480,"press <enter> to
continue":INPUT L: IF L=ENTER GO
TO60
420 CLS(8)
430 PRINTSTRING$(32,42)
440 PRINT @ 35, "*THE HIGH LEVEL
 HORNPIPE*"
450 PRINTSTRING$(32,42)
460 A$="O3T2L8.DL16C"
470 B$="O2L16B-O3DO2FB-DFB-O3DFB
-DFO2B-O3DCO2B-O3CE-CO2B-AFAO3CA
GFAGFDC"
480 C$="O2L16B-O3DO2FB-DFB-O3DFB
-DFO2B-O3DCO2B-GAB-O3CDEFGAGCO2A
L8B-"
490 D$="O3L8.CO2L16B-"
500 E$="O2L16AO3FCFO2AO3FCFO2AFA
O3CFCO2AFO3DFO2B-O3FDFO2B-O3FDO2
B-O3DFB-FDO2B-"
510 F$="O3L16EGCGEGCGECEGB-GECFE
FAGFEGL8FFF"
520 X$="XA$;XB$;XC$;XB$;XC$;XD$;
XE$;XF$;XE$;XF$;"
530 PLAY X$
540 PLAY X$
550 PRINT @227,"A LONG TIME FAVO
RITE AT FIDDLING CONTESTS";
560 PRINT@480,"press <enter> to
continue":INPUT L: IF L=ENTER TH
EN GOTO 60
570 CLS(4)
580 PRINTSTRING$(32,42)
590 PRINT@35,"*THE PATRONELLA BR
EAKDOWN*"
600 PRINTSTRING$(32,42)
610 A$="T2O2L16DO3AL8F#L16AF#L8E
L16AF#L8DDDL16F#AO3L8DL16C#DL8ED
```

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```
L16C#DO2BO3C#O2L8AO3L16DO2A"
620 B$="O2L8F#L16AF#L8EL16AF#L8D
DDL16F#AO3L8DL16C#DL8EC#L4DL8D"
630 C$="O3L16DO2AL8F#L16O3F#L8O2
AL16AF#L8DL16GF#EDC#O2BL8AO3L16E
C#O2L8AO3L16GEL8F#L16F#DO2AO3DO2
AF#"
640 D$="O2L8DO3L16F#DO2L8AO3L16A
F#L8GL16GF#EDC#O2BL8AL16O3EC#O2A
O3GEC#L4DL8D"
650 X$= "XA$;XB$;XA$;XB$;XC$;XD$
;XC$;XD$;XA$;XB$;XC$;XD$;"
660 PLAY X$
670 PRINT@227,"THE BREAKDOWN--TH
E FINAL SET OF A SQUARE DANCE";
680 PRINT@480,"press <enter> to
continue":INPUT L:IF L=ENTER THE
N GOTO 60
690 CLS(4)
700 PRINTSTRING$(32,42)
710 PRINT @ 38, "*THE DILL PICKL
E RAG*"
720 PRINTSTRING$(32,42)
730 A$="L4T3O2BO3CC#"
740 B$="O3T4L8DEGDEGDEGDEGGEL4DO
2L8GABGABGABGABBAL4GL8DEF#DEF#DE
F#DEF#F#EL4D"
750 C$="O2L8GF#GEEF#GG#AG#AO3DDO
2BO3CC#"
760 D$="O2L8AG#AO3DDO2BL4AL2GL8G
GF#E"
770 E$="O2L4DE-EF#GO3L8EDDEL4DO2
L4F#O2L8EDDEL4DO2L4GO3L8EDDEL4DO
2L8DAEAFAF#AL4GO3L8EDDEL4D"
780 F$="O2L8ABO3C#O2ABL4.C#L2DL8
DO2GF#E"
790 G$="O3L8DEF#DEL4F#L2G"
800 H$="O3L8CO2AGO3CO2AGEFGEGAAG
L4EL8DC#DGGEL4DL2CL4ABO3L8CO2AGO
3CO2AGEFGEGAAGL4EL8AG#AO2DDO2BAL
2GL4AB"
810 I$="O3L8CO2AGO3CO2AGEFGEGAAG
L4EL8DC#DGGEL4DL2CO3L4CO2BAL8ABO
3CO2BO3CDED#EAAGEDC#DGGEL4D"
820 J$="O3L2.CO2L8AB"
830 K$="O3L2.C"
840 X$="XA$;XB$;XC$;XB$;XD$;XE$;
XF$;XE$;XG$;XH$;XI$;XJ$;XH$;XI$;
XK$;"
850 PLAY X$
860 PLAY "XB$;XC$;XB$;XD$;XE$;XF
$;XE$;XG$;XH$;XI$;XJ$;XH$;XI$;XK
$;"
870 PRINT @ 225, "HOW IS THAT FO
R A DILL PICKLE?";
880 PRINT@480,"press <enter> to
continue":INPUT L:IF L=ENTER THE
N GOTO 60
890 C=RND(8)
900 CLS (C)
910 PRINTSTRING$(32,42)
920 PRINT@35,"*THE BLACK AND WHI
TE RAG*"
930 PRINTSTRING$(32,42)
940 A$="T4O3L8DDDDC#C#"
950 B$="T4O2L8CDF#CDF#CDF#CDF#F#
CDCO2A#BO3EO2ABO3EO2AB"
960 C$="T4O3L8EO2A#BO3EEDO2BGO3L
8CDBO3CCO2BO3CO2AG#ABO3CO2AF#DGO
2F#AGO2BO3CC#D"
970 D$="T4O2L8BGEGL4GO3L8DC#CDF#
CDF#CDF#CDF#F#CDCO2A#BO3EO2ABO3E
O2AB"
980 E$="T4O3L8EO2A#BO3EEDO2BGL4E
L8G#BO3EGCO2AAG#AO3CEDCO2ABDGBBG
L4A"
990 F$="T4O2L8GGO3DDDDC#C#"
1000 G$="T4O2L1G"
1010 H$="T4O2L4GL8F#GGF#L4GO3L4E
L8D#EEDL4EDL8C#DDC#L4D"
1020 I$="T4O2L4AAAG#L8F#GBF#GBF#
GBF#GBBAGF#D#EADEADEAD#EAAO3CO2A
EGGF#GGFL4GO3L4EL8D#EEDL4EDL8C#D
DC#L4DO2L4AAAG#"
1030 J$="T4O2L8GABO3CDEFGAGFEDCO
2BAGF#GO3EECL4DCCCC"
1040 K$="O2L8BO3DGO2GBO3DO2DGBO1
BO2DGGBO3DO2AF#AF#CF#DCFGG#AAGL4
A"
1050 L$="T4O3L8CDF#O2AO3CEO2F#AO
3DO2FAO3CCDF#DO2L4BL8DGBO3CO2L4G
L8BO3CC#DDCO2BA"
1060 M$="T4O2L8G#BO3EO2BGEO1BO2E
G#O1BO2EGL4O1BBO2L8AO3C#EO2EAO3C
O2C#EAO1AO2C#EO1L4AAO2L8BO3DGO2G
BO3DO2DGBO1BO2DGGBO3DO2BFGAO3DDO
2ABDL4GGGG"
1070 X$="XA$;XB$;XC$;XD$;XE$;"
1080 Y$="XF$;"
1090 V$="XG$;"
1100 PLAY X$
1110 PLAY Y$
1120 PLAY X$
1130 PLAY V$
1140 O$="XH$;XI$;XJ$;"
1150 PLAY O$
1160 PLAY O$
1170 S$="XK$;XL$;XM$;"
1180 PLAY S$
1190 PLAY S$
1200 PRINT@231," A PIANO SHOW PI
ECE";
1210 PRINT@480,"press <enter> to
 continue":INPUT L:IF L=ENTER GO
TO60
1220 CLS:PRINT@135,"THAT'S ALL F
OLKS.."
1230 PRINT@199,"HAVE A GOOD DAY!
"
1240 GOTO 1240
```

A circuit enabling you to produce sound internally from your CoCo

SOUND INTERNAL

BY DAVID HUANG

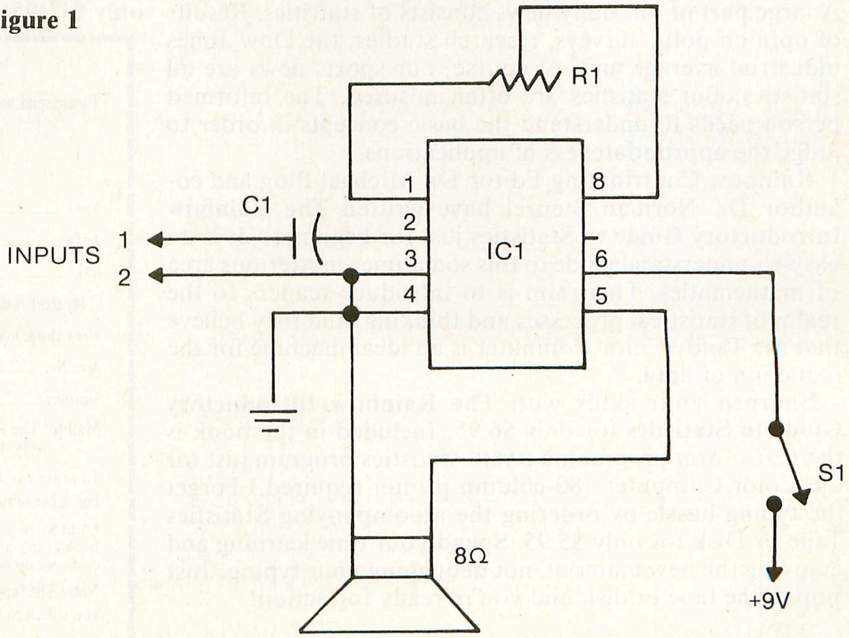
Since I am a novice in electronics, I decided to test my ability by making an internal sound circuit for my CoCo. This circuit enables you to produce sound internally from your CoCo without having your TV or monitor on. The circuit is an audio amplifier; it makes the weak sound signal from the computer strong enough to drive a speaker separate from that of the TV or monitor. The audio amplifier utilizes an audio amp IC, which can be bought at your local Radio Shack store along with the other parts for the circuit. To build this circuit you will need a soldering iron, solder, 22-gauge wire or higher, and the parts shown in Table 1, all of which are also available at Radio Shack.

David Huang is a high school freshman who has been programming the CoCo for over three years.

Table 1

Cat. No	Part	Description
272-121	C1	47 uF capacitor
271-338	R1	mini 100K potentiometer
275-406	S1	SPST mini switch
40-245	SP1	8-ohm speaker
276-1731	IC1	audio amp IC
276-1995	—	8-pin DIP socket
270-325	—	9-volt battery snap
276-148	—	mini PC board

Figure 1

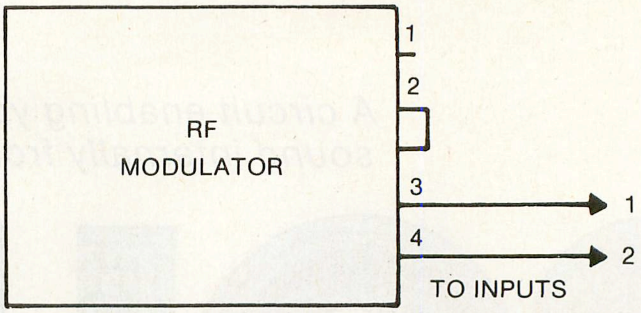


To build the audio amp, follow the schematic diagram of the circuit in Figure 1. Use the 22-gauge wire to interconnect the parts on the PC board. You must solder the 8-pin DIP onto the board first, then install the audio amp IC when you have finished building the project. The 9-volt battery snap is to be soldered with the red wire to the +9V and the black wire to the ground symbol.

You may substitute any PC board or speaker for those listed above, but remember that the speaker must be small enough for the circuit to drive. After the project is complete, solder the input leads of the circuit to the wires that contain the computer's sound signal going to the RF modulator; follow the diagram in Figure 2. Then plug in a 9-volt battery to the circuit, turn on the computer and switch the circuit on.

You may use any program or command that produces sound on the computer. Sound should emerge from the circuit speaker rather than from that of the TV or monitor. If it doesn't, check the circuit for flaws or mistakes. If you want the sound routed to the TV or monitor speaker, simply switch off the circuit. The 100K mini PC potentiometer controls the gain or volume of the circuit.

Figure 2



I placed the circuit on top of the computer's RF modulator, with an insulator between the two to prevent a short circuit. It may be a little more difficult to place the circuit on the modulator of a CoCo 2, since that modulator is vertical rather than horizontal. The circuit doesn't have to be placed on the modulator, but there's no other better place to put it since the circuit is right over the wires onto which you have to solder your inputs. I used detachable wires to connect the circuit speaker to the top of the cover so that I could lift the cover without breaking any wires.

(Questions or comments concerning this project may be directed to the author at 19138 Frankfort St., Northridge, CA 91324. Please enclose an SASE when requesting a reply.)

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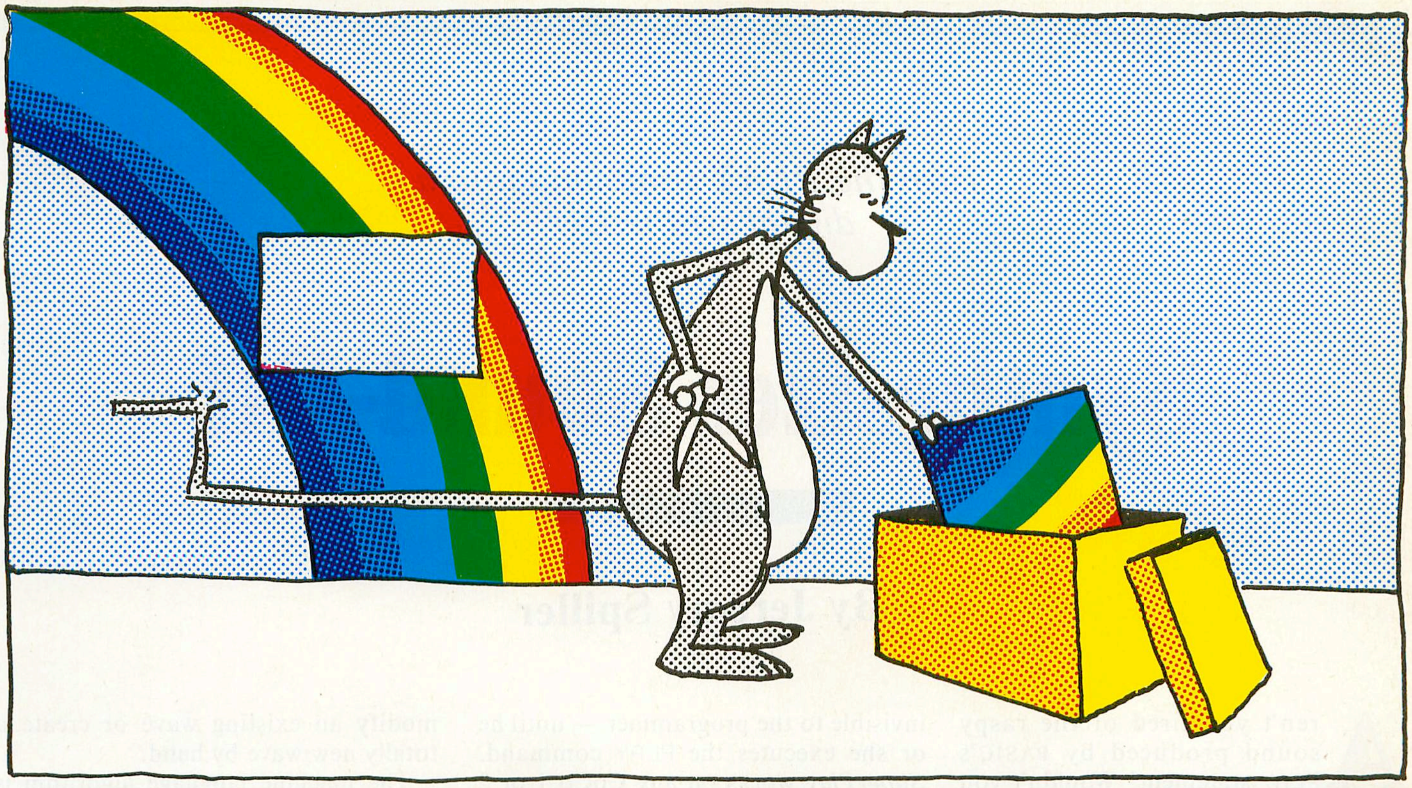

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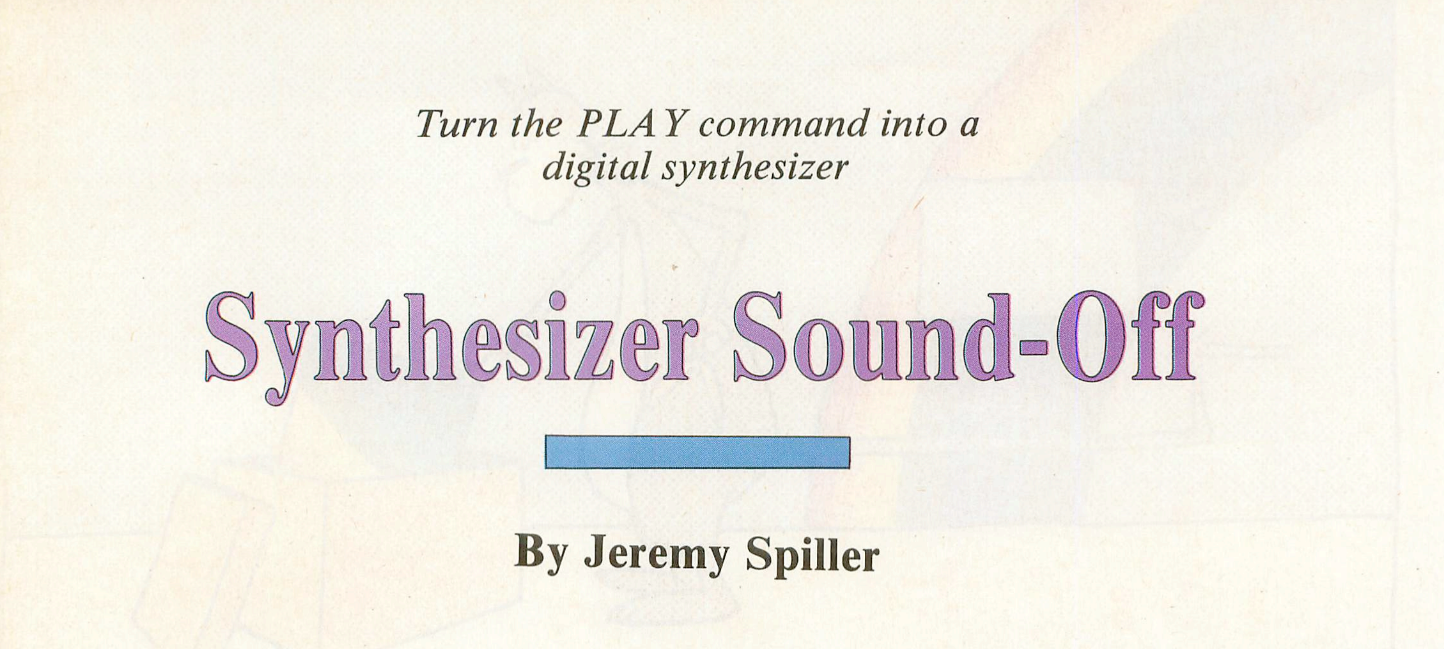

Turn the PLAY command into a digital synthesizer

Synthesizer Sound-Off

By Jeremy Spiller

Aren't you tired of the raspy sound produced by BASIC's PLAY statement? Wouldn't you really like your BASIC programs to play smooth and varied musical tones? Now with *SuperPlay* they can!

SuperPlay is a BASIC program that installs a machine language algorithm within the BASIC interpreter and turns the PLAY command into a true digital synthesizer. Because you can program your own sounds, your PLAY commands now sing out mellow, sharp-and-snappy, funky, squeaky or in almost any harmonic tone. Even more exciting, *SuperPlay* stores three separate sounds and allows you to switch among them in the middle of a PLAY string by using the newly created W (for waveform) command. You can even change all three sounds in the middle of a program, as new waveforms can be loaded directly into the interpreter from disk or tape.

Once installed, the *SuperPlay* algorithm remains a part of BASIC's operating system until you power down or press the reset button. You may type NEW and then program in BASIC as usual. You can load and run any BASIC program, and *SuperPlay* remains in place. Once installed, *SuperPlay* takes up no extra memory, and it is totally invisible to the programmer — until he or she executes the PLAY command. *SuperPlay* works on any CoCo 1 or 2 with 64K and Extended Color BASIC, or on any CoCo 3.

What's a Waveform?

Sounds are simply variations in air pressure produced by the vibrations of a flexible sheet called a diaphragm. Your TV loudspeaker has a diaphragm, and its vibrations are controlled electronically. If you can vary the voltage to the loudspeaker in the same way that the sound of, say, a flute varies the air pressure, you can reproduce the sound of the flute. Computerized sound synthesis means that your CoCo uses numbers in its memory to tell the diaphragm exactly where to position itself nanosecond by nanosecond. We decide what numbers to place in memory by drawing a curve, called a waveform. As the wave curves upward, the diaphragm of the loudspeaker expands. As the wave curves down, the diaphragm contracts. *SuperPlay* allows you to determine the exact nature of the sound by specifying the exact position of the diaphragm through one cycle of movement. This cycle is repeated over and over again for as long as the sound is being produced.

Keying in the Program

There are two separate listings. Listing 1 is the *SuperPlay* program itself; if you don't intend to create your own waveforms, it is the only listing you have to key in. Listing 2 is the wave editor, which allows you either to modify an existing wave or create a totally new wave by hand.

The machine language algorithm is contained in DATA lines 630 through 730 of Listing 1. These lines must be keyed in *exactly* as printed. One misplaced or missing digit, and *SuperPlay* will not work. I have encoded checksums into these lines, so if you make any errors the program will tell you in which of these 11 lines the error occurred. The strings in the data lines do not contain the letter 'O'; they do, however, contain numerous zeros. Exchanging a letter 'O' for a zero will be the most common error, so please check this carefully.

Save the program before running it! When saving *SuperPlay*, be sure to shorten the filename to eight letters, or you will get an FN Error. You must also be especially careful about keying in poke statements. Machine language programs are very unforgiving, and you could end up losing everything you have typed in if you mistakenly poke the wrong number into the wrong place. Double-check the arguments for all poke statements before running the program. Note that all pokes are in hexadecimal. The argument is always preceded by &H and contains only zeros — no O's.

Now run the program. If you make it through the algorithm installation without error messages, you should see a PMODE4 screen drawing out the three default waves. It does this by using the formulas in lines 490 through 620. (Every curve has a mathematical formula, and every mathematical formula can be used to draw a curve.)

Jeremy Spiller is a high school junior who has been programming in assembly language for four years. He has recently begun writing commercial software and has launched his own software company.

D. Webb '87

I have included 14 different wave formulas in *SuperPlay*, of which only three may be installed at one time. However, you can easily substitute different waves by plugging their line numbers into Line 82, which reads `ON W GOSUB 490,600,510`. You may choose any three of the line numbers between 490 and 620 to substitute for 490, 600 or 510.

Each formula produces its own unique sound. Some of these waves sound better playing low octaves, while some sound better in higher octaves. Some produce subtle harmonic undertones and sound like two octaves playing at once. Note that each formula is followed by `:RETURN`. If you forget to include this part of the line, the wave won't work! Each time you make your formula substitutions in Line 82, save each version of *SuperPlay* under a different filename.

After the waves are installed, the program plays a short demo (lines 100 through 350), comparing the old sound produced by BASIC and the much more exciting sounds produced after *SuperPlay* has been installed. It introduces you to the `W` command and demonstrates several ways to use it in your own programs. After you are familiar with the inner workings of *SuperPlay*, the entire demo may safely be deleted without affecting the program's execution.

During installation, *SuperPlay* has secretly given birth to a machine language version of itself, complete with wave tables and everything needed to install itself in the BASIC interpreter. Once you have saved this "ML clone," you will no longer have to run the original *SuperPlay* program that you have so laboriously keyed in. Simply load the clone and execute. You will not have to wait for the long computations necessary to install the three waves.

After the demo, *SuperPlay* will prompt you for tape or disk and a filename. I assume you will create numerous clones, each with its own set of waveforms, and, of course, its own filename.

Using *SuperPlay* with your BASIC Programs

There are two ways to configure your CoCo to use *SuperPlay*. The most time-consuming way is to run *SuperPlay* (the one you keyed in) after powering up the computer. This installs *SuperPlay* and its waveforms. After it has run, you may type `NEW` and use the computer for any BASIC programming task. The *SuperPlay* algorithm remains a part of BASIC's operating system until you press reset or power down.

The fastest way to install *SuperPlay* is to use one of your ML clones. These are loaded directly off tape or disk, and you won't have to sit around waiting for the waves to be poked in. Let's say that you saved an ML version of *SuperPlay* as `SILYWAVE`. Load it by using the following boot program:

```
10 CLEAR 200,&H7B7C
20 LOADM "SILYWAVE"
(tape users substitute CLOADM)
30 EXEC
40 CLEAR 200, &H7FFF
50 PLAY "V31"
```

This boot program may be saved separately with the same filename as the version of *SuperPlay* it calls. You can then just type `RUN"SILYWAVE"` if you have a disk drive, or you can type `CLOAD"SILYWAVE":RUN` if you are using tape. Note that it is important to include a volume command or else your `PLAY` statements will play too softly.

The W Command

We have added new dimension to the sound available to your BASIC programs through `PLAY` statements. Unlocking the full potential of *SuperPlay* requires a mechanism to change waveforms instantly, and the `W` command does just that! The syntax to use is `PLAY W1` or `W2` or `W3`. An example might be:

```
'A$="L2O3W2CW1CW3L5CG":PLAY
A$'
```

The `W` command may be placed anywhere within the string just like any other `PLAY` command. It takes up no real time so it doesn't change the beat or tempo of your song. It produces no sound itself, but it does change the sound of all the notes played after its occurrence (just like the `L` and `O` commands).

Remember, however, that the last wave used remains the default wave, even if you load and run a different program. It is best, therefore, to place a `W` command early in your new program in order to avoid beginning your songs in an unwanted wave table.

Creating and Editing Waveforms

The simplest method of installing coherent waveforms is to use any three of the mathematical formulas provided in *SuperPlay*. If you are good at mathematics and have an understanding of Fourier theory, you can have a good time making up your own wave formulas. (I can tell you from experience that it isn't that difficult, and all of mine were produced by trial and error.) First, be sure that *SuperPlay* is installed. Then save lines 80 through 84 as a separate program. This little program can be used to poke your experimental formulas into the interpreter and graph them at the same time. All values of the variable `A` must be between zero and 255. Begin with a simple trigonometric function such as $A=sin(x)*127+128$, which produces a compatible sine wave; vary the numbers to see how the shape and position of the wave changes, and then begin to elaborate. As time goes on, you'll get a feel for how the functions vary, and then you'll be creating your own waves from scratch. A friend of mine became obsessed with creating waves, and I am guessing a few of you will, too. If you come up with any good ones, send them to me and I'll forward them to readers who inquire about the program.

Unfortunately, most people don't enjoy this form of self-torture, and for that reason `WAVEDIT` is provided in Listing 2.

The Wave Editor

The wave editor is itself a great toy because it allows you to experiment with sound. It is menu-driven. To return to the menu while editing, just press the M key. You can edit or save the waves currently in memory, or you can load previously saved wave sets, provided they have been saved from the editor in immediate-load format.

In order to edit a wave, you must first have installed *SuperPlay*, using Listing 1 or one of your ML clones. When you run `WAVEDIT`, it peeks into high memory and draws out one of the resident waveforms on your screen. You can now use the arrow keys to move the cursor anywhere on the page. Pressing the SHIFT key while pressing the arrows moves the cursor faster. When you want to set a point, press the ENTER key. This resets the old point, sets the new one and advances the cursor to the next position to the right. It also immediately changes the resident waveform so that the one *SuperPlay* uses looks like the one you see. There are 256 points, each of which can be set to a value between 0 and 255 (determined by the vertical position of the point you set).

You can test your curve at any time during editing by pressing one of the number keys 1 through 5. Pressing one of these keys plays a C note in that octave using your waveform. You can play the wave each time you set a new point and listen to the way its sound changes. While the smoothest and most harmonic waves have no sharp points in them and always start and end at the same vertical position, you are by no means obligated to follow any rules in creating your own waveforms.

For instance, change the smooth curves on the resident wave to make sharp points; then play the new waveform by pressing the number keys. Try building a triangular wave that looks like a pyramid, or try two disjointed horizontal lines. You can even use random points scattered all over the screen. This will produce a buzz instead of a tone, but your `PLAY` statements will play that buzz at the correct pitch, so you will still get a reasonable rendition of your tune. A single flat, horizontal line produces only silence.

Quick-Changing Waveforms

After editing any or all of the waves, you can then save your new waveset under an appropriate filename. These wavesets are different from the ML clones that you created earlier. They are in immediate-load format. In order to use them, *SuperPlay* must already be installed. You simply `LOADM` a waveset to substitute the new waves for the old. You do not have to `EXEC` them like you did for the ML clone. This means that you can quickly change wavesets in the middle of a program.

(Questions or comments concerning this program may be directed to the author at P.O. Box 1094, Townsend, MA 01469. Please enclose an SASE when requesting a reply.) ☐

90	83
290	48
410	9
480	7
620	83
END	90

Listing 1: `SUPRPLAY`

```
1 '****************************
2 '*        SUPERPLAY         *
3 '*      (C) 1987 BY         *
4 '*       JEREMY SPILLER     *
5 '****************************
10 CLEAR 2000,&H7B7C:RESTORE
20 PO=&H7B7D:CH=0:FOR D=1 TO 11:
CLS:PRINT"WORKING ON LINE";D:CH=
0
30 READ D$:FOR X=1 TO LEN(D$)/2-
1:P=VAL("&H"+MID$(D$,X*2-1,2)):P
OKE PO,P:CH=CH+P:PO=PO+1:NEXT X
40 IF RIGHT$(D$,2)<>RIGHT$("00"+
HEX$(CH),2) THEN PRINT"ERROR IN
LINE";D:STOP
```

One-Liner Contest Winner . . .

Attention, algebra students! Do quadratics give you nightmares? With this shortie, CoCo will solve quadratics in the form of $AX^2+BY+C=O$. All you have to do is enter the values for *A*, *B* and *C*.

The listing:

```
0 CLS:INPUT"SOLVE A*X*X+B*X+C=0
ENTER A,B,C";A,B,C:D=(B*B-4*A*C)
:IFD=0THENPRINT"X1=X2=";-B/2*A:E
LSEIFD<0THEND=SQR(ABS(D)):PRINT"
X1=";-B/(2*A)"+"D/(2*A)"I":PRINT
"X2=";-B/2*A"-"D/(2*A)"I":ELSEIF
D>0THEND=SQR(D):PRINT"X1="(-B+D)
/2*A:PRINT"X2="(-B-D)/2*A
```

Richard Larson
Apple Valley, MN

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

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```
50 NEXT D
60 CLS:PRINT"POKING PITCH TABLE"
:R=1.0594631:PITCH=545:REM------
--MODIFY 'PITCH' IF THE NOTES
 SEEM OFF.
70 Z=&H7C80:S=1:FORX=0TO60:P=S*P
ITCH:A=INT(P/256):B=P-A*256:POKE
Z,A:POKEZ+1,B:Z=Z+2:S=S*R:NEXT
80 PMODE 4,1:PCLS:SCREEN 1,1:B=&
H7C00:FOR W=1 TO 3:PCLS:B=B+256:
A=0:Z=0:FOR X=0 TO 6.2831853 STE
P 0.0246399424
82 ON W GOSUB 490,600,510
84 POKE B+Z,A:PSET(Z,A/2):Z=Z+1:
NEXT X,W
90 EXEC &H7B7D
100 JS$="V31W1
110 J1$="T4L2O3CD"
120 J2$="L4EGFFAGGO4CO3BO4CO3GEC
DEFGAGFE"
130 J3$="DECO2GBO3DFED"
140 J4$="ECD"
150 J5$="O2GO3CO2BO3C"
160 J6$="L4EGO4CP2
170 J7$="W3T3L1O3EL2FGCGFDED
180 J8$="T4L4DW2FEFDO2BGBO3DFED
190 J9$="W1ECD
200 J$="W1"+J2$+J3$+"W2"+J4$+J2$
+J5$+J6$
210 POKE&HFFDE,0:CLS:PRINT"THIS
IS HOW THE old PLAY STATE- MENT
SOUNDS!"
220 PLAY J1$+J2$+J3$+J4$+J2$+J5$
+"P1"
230 POKE&HFFDF,0:CLS:PRINT@140,"
SUPERPLAY":PRINT@200,"BY JEREMY
SPILLER"
240 PLAY "P1"+JS$+J1$+J$
250 PLAY J7$+J8$+J7$+J8$+J9$+J$
260 D1$="V31W1T4O3L8C"
270 D2$="L8CFFL4EDCO2AO3L4O1W3AA
280 D3$="W2O3L8CCFFL4EDD+EO4W3O1
EE
290 D4$="T4W3O3L4EECDW1EECDW2L8E
EL4EDCO2A
300 D5$="T4L4O1W3FO3AAP4O1CO3AAP
4O1FO3AO1CO3AO1FO3AA
310 PLAY D1$+D2$+D3$+D4$+D5$+D1$
+D2$+D3$+D4$+"L2O1FP1"
320 L1$="V31T5O3L3EL8DL4CDEDECDD
DL1D
330 L2$="L4DL8CL4O2BO3CDCDO2BO3C
CCL1C
340 L3$="L3O2GL8G+L3AL8G+L3GL8G+
L3AL8G+L4G
350 PLAY "W1"+L1$+"W2"+L2$+"W3"+
L3$+"O3DDL1DW2"+L3$+"O3EEL1E"+"W
1"+L1$+"W3L4DL2C+L4DL2EEL1G"
360 CLS:PRINT@136,"THATS ALL FOL
KS!"
370 PRINT@256,"WELL, NOT QUITE A
LL! IF YOU      WANT TO SAVE THIS
 VERSION OF     SUPERPLAY AS AN M
L PROGRAM,      PRESS <T>APE, <D>
ISK OR <Q>UIT"
380 A$=INKEY$:IF A$=""THEN 380
390 IF A$="Q"THEN END ELSE IF A$
="T"THEN 400 ELSE IF A$="D" THEN
 430 ELSE 380
400 CLS:PRINT"YOU HAVE CHOSEN A
SAVE TO TAPE. PLEASE PLACE A TAP
E IN YOUR       RECORDER AND PREPA
RE TO RECORD  THIS VERSION OF SU
PERPLAY.":Q$="CLOADM":GOSUB 450
410 IF F$="" THEN 360
420 CSAVEM F$,&H7B7D,&H7FFF,&H7B
7D:GOTO 460
430 CLS:PRINT"YOU HAVE CHOSEN A
SAVE TO DISK. PLEASE PLACE A DIS
KETTE IN YOUR DRIVE TO SAVE THIS
 VERSION OF     SUPERPLAY.":Q$="LO
ADM":GOSUB 450
440 IF F$=""THEN 360 ELSE SAVEM
F$,&H7B7D,&H7FFF,&H7B7D:GOTO 460
450 PRINT:PRINT"PLEASE TYPE A SU
ITABLE FILENAME (8 LETTERS OR LE
SS) OR <ENTER>  ALONE TO ABORT."
:INPUT F$:RETURN
460 CLS:PRINT F$:PRINT"HAS NOW B
EEN SAVED AS A STAND-  ALONE ML
PROGRAM. TO INSTALL    IT SIMPLY
 RUN THE FOLLOWING     PROGRAM:"
470 PRINT:PRINT"10 CLEAR 200,&H7
B7C":PRINT"20 ";Q$;CHR$(34);F$;C
HR$(34):PRINT"30 EXEC":PRINT"40
CLEAR 200,&H7FFF":PRINT"50 PLAY"
;CHR$(34);"V31";CHR$(34)
480 PRINT:INPUT"ANOTHER SAVE (Y
OR N)";A$:IF A$="Y" THEN 360 ELS
E END
485 REM THE LINE NUMBERS OF ANY
    OF THE FOLLOWING FORMULAS
    MAY BE PLUGGED INTO LINE 82.
    (ON W GOSUB XXX,XXX,XXX)
490 A=COS(X)*88+COS(X*2)*44+SIN(
X*3)*22+COS(X*4)*11+95:RETURN
500 A=SIN(X)*64+SIN(X*2)*32+SIN(
X*3)*16+SIN(X*4)*8+SIN(X*8)*8+12
8:RETURN
510 A=80*ATN(SIN(5*X)+TAN(.2*X)+
COS(3*X))+128:RETURN
520 A=SIN(X)*32+COS(X*2)*32+SIN(
X*3)*32+COS(X*4)*32+128:RETURN
530 A=20*TAN(SIN(X)+COS(X))+128:
RETURN
540 A=SIN(X*X)*63+COS(X*X)*63+12
8:RETURN
550 A=COS(X/2)*127+128:RETURN
```

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```
560 A=COS(X/2)*32+SIN(X)*96+128:
RETURN
570 A=SIN(X)*127+128:RETURN
580 A=114*ATN(COS(4*X)+SIN(3*X))
+127:RETURN
590 A=230*TAN(SIN(X)*COS(X))+128
:RETURN
600 A=210*TAN(SIN(X*.99)*COS(X*1
.01))+133:RETURN
610 A=127*LOG(X+.01)*SIN(X)*COS(
X)+127:RETURN
620 A=100*ATN(COS(4*X)*SIN(X))+1
18:RETURN
625 REM THE DATA BELOW CONTAINS
    ONLY ZEROS. THERE ARE NO
    LETTER O'S, AND NO COMMAS.
    ALL LINES ARE EXACTLY THE
    SAME LENGTH!
630 DATA 86FB97F9B6FA8043B7FA80B
1FA8027161A508E80007FFFDEF1
640 DATA EC847FFFDFED818CFA8025F
11CAF338D001E308CD3ECC12763
650 DATA 16308B10AEC1ECC13402A68
0A7A0350283000126F320E339B0
660 DATA 00629A6D001B007D9AC7002
400A19B29006201 03FA8003804E
670 DATA 0000815727148156261 68D4
9C11F2252D7DF585858CA07D7B6
680 DATA E0397E9ADCBD9CCB5D26037
EB44A96E23DDDD50FFD0FFE7E31
690 DATA 9B44BD9CCB5AC10223022 0E
7CBFBD7F93996DEC60C7FFF401F
700 DATA 3DEBE0588EFA80EC85DDFDD
6F9D7FADCE13DDDD58D46DDE392
710 DATA 8E00AB1F12CEFFFF1A501E8
81E881E881E88A69F00FAD6E02D
720 DATA 3D8A03B7FF20DCFBD3FDDDF
B301F26E21F21334112DCE3938E
730 DATA D5DDE322DDFC011233CBFF0
112CC0000DDE339DDD5DDE3220C
```

Listing 2: WAVEDIT

```
1 '*****************************
2 '*       WAVE EDITOR         *
3 '*    BY JEREMY SPILLER      *
4 '*          (C) 1987         *
5 '*****************************
15 S$=CHR$(13)+CHR$(94)+CHR$(10)
+CHR$(8)+CHR$(9)+CHR$(95)+CHR$(9
1)+CHR$(21)+CHR$(93)+"12345":DIM
P(6,6)
20 CLS:PRINT"  WAVE EDIT   BY JE
REMY SPILLER"
30 PRINT:PRINT"      1) LOAD WAV
EFORMS":PRINT"      2) SAVE WAVE
FORMS":PRINT"      3) EDIT WAVEF
ORM":PRINT
40 LINE INPUT"ENTER SELECTION: "
;I$
50 ON VAL(I$) GOSUB 100,200,300:
GOTO 20
100 CLS:PRINT"LOAD WAVEFORM":GOS
UB 250:IF T$="T" THEN CLOADM N$
ELSE LOADM N$
110 RETURN
200 CLS:PRINT"SAVE WAVEFORM":GOS
UB 250:IF T$="T" THEN GOTO 205 E
LSE SAVEM N$,&HFB00,&HFDFF,&HB44
A:GOTO 210
205 CSAVEM N$,&HFB00,&HFDFF,&HB4
4A
210 RETURN
250 PRINT:INPUT"(D)ISK OR (T)APE
";T$:IFT$<>"D"ANDT$<>"T"THEN250
260 LINE INPUT"ENTER FILE NAME:
";N$:RETURN
300 CLS:LINEINPUT"WHICH WAVE FOR
M WOULD YOU LIKE  TO WORK ON (1-
3): ";W$:W=VAL(W$):IF W<>INT(W)
OR W<1 OR W>3 THEN 300
310 PMODE4,1:PCLS:SCREEN1,1:X=12
8:LINE(0,X)-(255,X),PSET:Y=64
320 W=&HFB00+(W-1)*256:FOR I=0 T
O 255:PSET(I,PEEK(W+I)/2):NEXT
330 H=((X-3<0)+1)*(X-3):V=((Y-3<
0)+1)*(Y-3):GET(H,V)-(X+3,Y+3),P
,G:DRAW"BM=X;,=Y;NE3NF3NG3NH3"
340 I$=INKEY$:IF I$="" THEN 340
ELSE PUT(H,V)-(X+3,Y+3),P,PSET:O
N INSTR(1,S$,I$) GOSUB 500,550,6
00,650,700,750,800,850,900,950,9
50,950,950,950:IF I$<>"M" THEN 3
30 ELSE RETURN
500 PRESET(X,PEEK(W+X)/2):PSET(X
,Y):POKE W+X,Y*2:X=X+1:IF X>255
THEN X=255:RETURN ELSE RETURN
550 Y=Y-1:IF Y<0 THEN Y=0
560 RETURN
600 Y=Y+1:IF Y>127 THEN Y=127
610 RETURN
650 X=X-1:IF X<0 THEN X=0
660 RETURN
700 X=X+1:IF X>255 THEN X=255
710 RETURN
750 Y=Y-4:IF Y<0 THEN Y=0
760 RETURN
800 Y=Y+4:IF Y>127 THEN Y=127
810 RETURN
850 X=X-8:IF X<0 THEN X=0
860 RETURN
900 X=X+8:IF X>255 THEN X=255
910 RETURN
950 PLAY"V31L4T4W"+W$+"O"+I$+"C"
:RETURN
```

How To Read Rainbow

When we use the term CoCo, we refer to an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

The BASIC program listings printed in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little disk and/or cassette symbols on the table of contents and at the beginning of articles indicate that the program is available through our RAINBOW ON DISK or RAINBOW ON TAPE service.

Using Machine Language

The easiest way to "put" a machine language program into memory is to use an editor/assembler, a program you can purchase from a number of sources. All you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of putting an ML listing into CoCo is called "hand assembly" — assembly by hand, which *sometimes* causes problems with `ORIGIN` or `EQUATE` statements. You ought to know something about assembly to try this.

Use the following program if you want to hand-assemble ML listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I, VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the `&H3F00` in Line 10 to `&H7F00` and change the value of `I` to `&H7F80`.

OS-9 and RAINBOW ON DISK

The OS-9 side of RAINBOW ON DISK contains two directories: `CMDS` and `SOURCE`. It also contains a file, `read.me.first`, which explains the division of the two directories. The `CMDS` directory contains executable programs and the `SOURCE` directory contains the ASCII source code for these programs. BASIC09 programs will only be offered in source form so they will only be found in the `SOURCE` directory.

OS-9 is a very powerful operating system. Because of this, it is not easy to learn at first. However, while we can give specific instructions for using the OS-9 programs, you will find that the OS-9 programs will be of little use unless you are familiar with the operating system. For this reason, if you haven't "learned" OS-9 or are not comfortable with it, we suggest you read *The Complete Rainbow Guide to OS-9* by Dale Puckett and Peter Dibble.

The following is not intended as a course in OS-9. It merely states how to get the OS-9 programs from RAINBOW ON DISK to your OS-9 system disk. Use the procedures appropriate for your system. Before doing so, however, boot the OS-9 operating system according to the documentation from Radio Shack.

1) Type `load dir list copy` and press ENTER.
2) If you have only one disk drive, remove the OS-9 system disk from Drive 0 and replace it with the OS-9 side of RAINBOW ON DISK. Then type `chd/d0` and press ENTER. If you have two disk drives, leave the sytem master in Drive 0 and put the RAINBOW ON DISK in Drive 1. Then type `chd/d1` and press ENTER.
3) List the `read.me.first` file to the screen by typing `list read.me.first` and pressing ENTER.
4) Entering `dir` will give you a directory of the OS-9 side of RAINBOW ON DISK. To see what programs are in the `CMDS` directory, enter `dir cmds`. Follow a similar method to see what source files are in the `SOURCE` directory.
5) When you find a program you want to use, copy it to the `CMDS` directory on your system disk with one of the following commands:

One-drive system: `copy /d0/cmds/`*filename*`/d0/cmds/`*filename*`-s`

The system will prompt you to alternately place the source disk (RAINBOW ON DISK) or the destination disk (system disk) in Drive 0.

Two-drive system: `copy /d1/cmds/`*filename*`/d0/cmds/`*filename*

Once you have copied the program, you execute it from your system master by placing that disk in Drive 0 and entering the name of the file.

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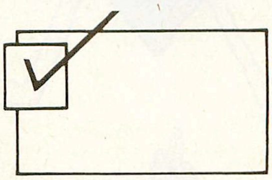


The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

Rainbow Check PLUS counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS*, type in the program and save it for later use, then type in the command `RUN` and press ENTER. Once the program has run, type `NEW` and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

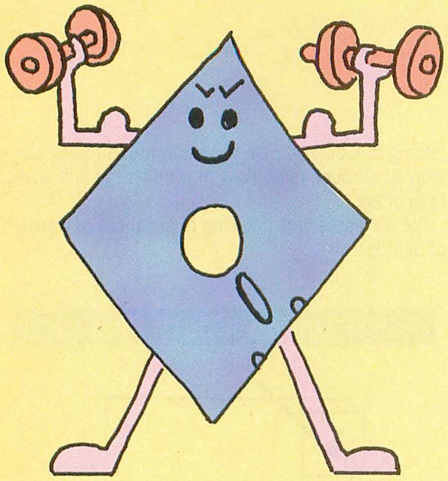
Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

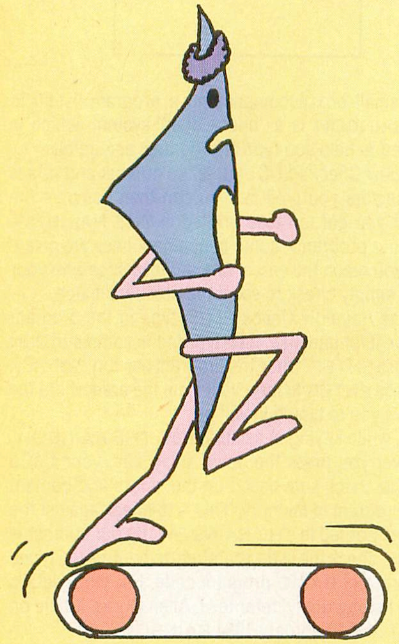
```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

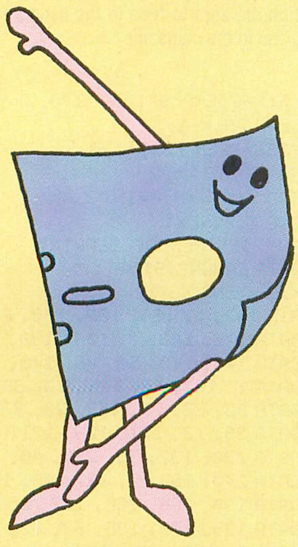
Putting floppy controllers through their paces

Exercise Your Drives

By Scott Honaker







A description of the floppy disk controller ICs from Western Digital appeared in Tony DiStefano's article in the October 1987 RAINBOW (Page 126). Here, I will show you how to make the WD 1773/1793 floppy disk controllers perform.

The controllers are almost computers in themselves. Not only do they provide all the hardware connections, but they are also programmable by means of a set of registers and commands. The commands are broken into different types, depending on function. Type I commands move the Read/Write head; Type II are the Read and Write sector commands; Type III commands read track and sector header blocks and read and write (format) tracks; and Type IV commands cause the current command to terminate.

In this article only basic functions and Type I commands are presented. The most convenient feature of these commands is that they can be accessed from BASIC, since they don't need to keep pace with the drive.

There are four registers in the controller ICs that are memory-mapped, meaning they can be poked and peeked like memory. The first is the Status/Command register at $FF48, followed by the Track register at $FF49, the Sector register at $FF4A and the Data register at $FF4B. When writing (poking) to the Status/Command register, you send it a command; during a read (peek), you will get the error status of the drive (see Table 1). It is possible by peeking this location to find the real error (or anticipate one), instead of puzzling out DOS's ambiguous I/O Error. In addition to the registers, a byte is devoted to external controls at $FF40 (see Table 2). By executing `POKE &HFF40, 9` (setting bits 0 and 3) you will

Table 1: Error Codes

Bit 7	Drive not ready
Bit 6	Write-protected
Bit 5	Head loaded/engaged (the head is against the disk surface)
Bit 4	Seek error (when verify active, track not verified)
Bit 3	CRC error (bad data)
Bit 2	Track 0 (indicates head is at outermost track)
Bit 1	Index (when set, indicates index hole has been detected)
Bit 0	Busy (another command in progress)

Table 2: Control Bits at $FF40

Bit 7	Wait enable (tells drive to HALT CPU)
Bit 6	Drive select 4
Bit 5	Double density enable
Bit 4	Start precompensation (on inner tracks)
Bit 3	Motor on
Bit 2	Drive select 2
Bit 1	Drive select 1
Bit 0	Drive select 0

All information shown in tables was provided by Western Digital in its *Storage Management Products Handbook.*

Scott Honaker is a senior at Western Washington University, where he is majoring in computer science and German. He owns several computers, including a new CoCo 3.

activate the motor in Drive 0. (If you have difficulty with binary, you might consider a converting calculator; I keep one next to my computer at all times.)

There are five Type I commands: Restore, Seek, Step, and Step-in and Step-out. All Type I commands with their respective options have codes less than 128 (see Table 3 and 4). The Restore command brings the Read/Write head to Track 0, as do many programs when exiting. The Seek command goes to a specific track number, which is loaded into the data register before the command is issued. This is the only Type I command that requires use of another register. The Step command steps one track in the same direction of the last movement. The Step-in command moves one track toward the higher-numbered tracks, while the Step-out command moves toward Track 0.

To issue any commands, you must first choose a drive and turn the motor on: `POKE &HFF40, 9` for Drive 0. Then set up any extra registers, in the case of the Seek command, followed by a poke to the command register of the desired command. A few options must be considered when calculating the command. The step rate depends entirely on how fast your drive will step. Tandy uses a 30-millisecond rate to ensure that any drive will work; but don't think that by changing it once, it stays that fast. Since each command contains this code, it resets with the next command. Loading the head is also optional. By loading the head, you simply cause the Read/Write head(s) to clamp down on the disk surface in preparation for a read or write command. It is released when the next command is issued. To verify the destination track, the drive must read the disk to see that it has arrived on the proper track (track and sector numbers are written to the disk during formatting). The track update flag determines only whether the track register on the FDC will be loaded with the new track value upon completion of the command.

Table 3: Type I Command Codes

Command	Bits 7	6	5	4	3	2	1	0
Restore	0	0	0	0	h	v	r1	r0
Seek	0	0	0	1	h	v	r1	r0
Step	0	0	1	t	h	v	r1	r0
Step-in	0	1	0	t	h	v	r1	r0
Step-out	0	1	1	t	h	v	r1	r0

Table 4: Bit Flag Summary

r0, r1 = Step rate at 1 MHz (CoCo)	r0 = 0, r1 = 0 6 milliseconds r0 = 1, r1 = 0 12 ms r0 = 0, r1 = 1 20 ms r0 = 1, r1 = 1 30 ms
v = Track number verify flag	v = 0 No verify v = 1 Verify on destination track
h = Head load/engage flag	h = 0 Unload head at beginning h = 1 Load head at beginning
t = Track update flag	t = 0 No update t = 1 Update track register

For example, if you wanted to restore the head to Track 0 as quickly as possible, you could activate Drive 0 (`POKE &HFF40, 9`), then calculate a Restore command. The controllers will step up to 6 ms; by not engaging the head you can save from 30 to 300 ms (depending on the drive) and an additional 15 ms by *not* verifying the destination track. This would make the binary command `00000000` or simply zero in decimal. By poking this number in the command register after the drive select, you will cause the heads to move at 6 ms to Track 0. Try it: `POKE &HFF40, 9` then `POKE &HFF48, 0` and listen to your drives scream, if they can move that fast! If not, use `POKE &HFF48, 3` (bits 0 and 1 set); this will step at 30 ms, as Radio Shack's does.

After a study of these commands, you'll find the *Driver* program very simple to use. It was written basically as an example of the various Type I commands. It does have one additional useful function: To clean the drive by loading the head and moving the head in and out. Take a look at the code, play with it and have a good time being a real hacker!

(Questions or comments concerning this program may be directed to the author at 1701 Lakeway Drive, Apt. 1, Bellingham, WA 98225. Please enclose an SASE when requesting a reply.) ☐

✓

210	5	4040	199
290	42	7020	43
2010	196	END	0

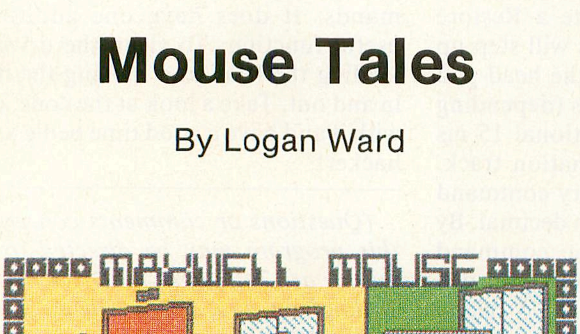
The listing: FDCAID

```
10 ' DRIVE EXERCIZER
15 ' BY SCOTT HONAKER  11/87
20 ' THIS PROGRAM DIRECTLY PROGR
AMS THE 1773/1793 FDC WITH TYPE
I COMMANDS
40 '
45 ' $FF40 - CONTROL REGISTER
50 ' $FF48 - COMMAND/STATUS REGI
STER
55 ' $FF49 - TRACK REGISTER
60 ' $FF4A - SECTOR REGISTER
65 ' $FF4B - DATA REGISTER
70 '
130 CLS:PRINT:PRINT"    DISK DRI
VE DEMONSTRATOR"
```

```
135 PRINT:PRINT"       BY SCOTT
HONAKER"
145 PRINT:PRINT:PRINT"     USED
TO DEMONSTRATE":PRINT" western d
igital 1773/1793 FDC"
150 PRINT"  TYPE I COMMANDS AND
ERRORS"
155 FOR T=1 TO 3000:IF INKEY$=""
 THEN NEXT
160 ' INITIALIZE VARIABLES
165 HE=0:MO=0:DR=0:R=30:RT=3:DD=
9:A=0:BL$="
                                "
200 ' PRINT MENU SCREEN
205 T=PEEK(&HFF49):S=PEEK(&HFF48
)
210 CLS:PRINT"TRACK: ";T,"STATUS
: ";S,"DRIVE: ";D,"RATE: ";R;"MS
"
215 PRINT:PRINT"<i> STEP IN (HIG
HER TRACK)"
220 PRINT"<o> STEP OUT (TOWARDS
TRACK 0)"
225 PRINT"<m> STEP- MOVE IN LAST
 DIRECTION";
230 PRINT"<r> RESTORE- MOVE TO T
RACK 0"
235 PRINT"<s> SEEK- MOVE TO SPEC
IFIC TRACK"
240 PRINT"<c> CLEAN DRIVE MODE"
245 PRINT"<d> DEFAULT DRIVE"
250 PRINT"<t> STEPPING RATE"
255 IF HE=0 THEN PRINT"<h> LOAD
HEAD"ELSE PRINT"<h> UNLOAD HEAD"
260 IF A=0 THEN PRINT"<a> KEEP D
RIVE ACTIVE" ELSE PRINT"<a> DEAC
TIVATE DRIVE"
265 PRINT:PRINT"command:";
270 A$=INKEY$:IF A$="" THEN 270
275 PRINT A$;
280 IF A$="I" THEN 1000
285 IF A$="O" THEN 2000
290 IF A$="M" THEN 3000
295 IF A$="R" THEN 4000
300 IF A$="S" THEN 5000
305 IF A$="C" THEN 6000
310 IF A$="D" THEN 7000
315 IF A$="T" THEN 7500
320 IF A$="H" THEN 8000
325 IF A$="A" THEN 8500
330 IF A$="Q" THEN CLS:POKE&HFF4
0,0:END
335 GOTO 205
500 IF(PEEK(&HFF48)/2)<>INT(PEEK
(&HFF48)/2)THEN500:' DELAY UNTIL
 NOT BUSY
510 RETURN
600 A$=INKEY$:IF A$=""THEN610 EL
SE X=30:RETURN
610 IF(PEEK(&HFF48)/2)<>INT(PEEK
(&HFF48)/2)THEN600
620 RETURN
1000 C=80+HE+RT:' STEP IN "N" NU
MBER OF TRACKS
1010 PRINT@480,"step in how many
 tracks";:INPUT N
1020 IF A=0 THEN POKE&HFF40,DD
1030 FOR X=1 TO N
1040 POKE&HFF48,C
1050 GOSUB 500
1060 NEXT X
1070 IF A=0 THEN POKE&HFF40,0
1080 GOTO 205
2000 C=112+HE+RT:' STEP OUT "N"
TRACKS
2010 PRINT@480,"step out how man
y tracks";:INPUT N
2020 IF A=0 THEN POKE&HFF40,DD
2030 FOR X=1 TO N
2040 POKE&HFF48,C
2050 GOSUB 500
2060 NEXT X
2070 IF A=0 THEN POKE&HFF40,0
2080 GOTO 205
3000 C=48+HE+RT:' STEP IN DIRECT
ION OF LAST MOVEMENT "N" TIMES
3010 PRINT@480,"step how many tr
acks";:INPUT N
3020 IF A=0 THEN POKE&HFF40,DD
3030 FOR X=1 TO N
3040 POKE&HFF48,C
3050 GOSUB 500
3060 NEXT X
3070 IF A=0 THEN POKE&HFF40,0
3080 GOTO 205
```

Mouse Tales

By Logan Ward


MAXWELL MOUSE
PARALLEL PARKING ONLY.
OH OH! I FORGOT TO BRING MY SERIAL TO PARALLEL CONVERTER!
© L.W. 1986

```
4000 C=0+HE+RT:' RESTORE TO TRAC
K 0
4010 IF A=0 THEN POKE&HFF40,DD
4020 POKE&HFF48,C
4030 GOSUB 500
4040 IF A=0 THEN POKE&HFF40,0
4050 GOTO 205
5000 C=16+HE+RT:' SEEK A TRACK
5010 PRINT@480,"enter track to s
eek";:INPUT ST
5020 IF ST>80 THEN 5010
5030 IF A=0 THEN POKE&HFF40,DD
5040 POKE&HFF4B,ST:POKE&HFF48,C
5050 GOSUB 500
5060 IF A=0 THEN POKE&HFF40,0
5070 GOTO 205
6000 PRINT@480,"insert head clea
ner <hit a key>";
6010 POKE&HFF40,0
6020 A$=INKEY$:IFA$=""THEN6010
6030 POKE&HFF40,DD
6040 FOR X=1 TO 30
6050 POKE&HFF48,8+HE+RT
6060 GOSUB 600
6070 POKE&HFF4B,34:POKE&HFF48,24
+HE+RT
6080 GOSUB 600
6090 NEXT X
6100 IF A=0 THEN POKE&HFF40,0
6110 GOTO 205
7000 PRINT@480,"enter new defaul
t drive (0-3)";
7010 INPUT D
7020 IF D>3 OR D<0 THEN7010
7030 IF D=0 THEN DD=9
7040 IF D=1 THEN DD=10
7050 IF D=2 THEN DD=12
7060 IF D=3 THEN DD=72
7070 GOTO 205
7500 PRINT@480,"new step rate (6
,12,20,30ms)";' CHANGE STEPPING
RATE
7510 INPUT R
7520 RT=-1
7530 IF R=6 THEN RT=0
7540 IF R=12THEN RT=1
7550 IF R=20THEN RT=2
7560 IF R=30THEN RT=3
7570 IF RT<0 OR RT>3 THEN7510
7580 GOTO205
8000 IF HE=0 THEN HE=8 ELSE HE=0
:' SET LOAD/UNLOAD FLAG
8010 GOTO205
8500 IF A=0 THEN A=DD ELSE A=0'
SET DRIVE ACTIVITY FLAG AND (DE)
ACTIVATE DRIVE
8510 POKE&HFF40,A
8520 GOTO205
```

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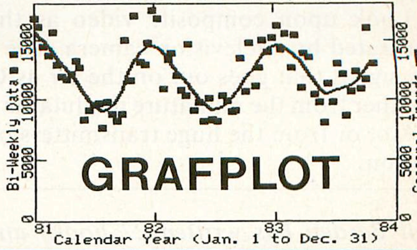

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Digitizing the World, Revisited

By William Barden, Jr.
Rainbow Contributing Editor

One of the first articles I did for RAINBOW was called "Digitizing the World" (January 1986). In it I lamented the fact that it wasn't easy to "digitize" characters or other shapes — that is, to convert them from printed form into CoCo graphics. In this month's column I'd like to tell you how I found a method to digitize just about anything in a few seconds. My picture in Figure 1, warts and all, shows the power of this digitizing method. Figure 2 shows another example of the technique — a digitized Mayan glyphic character taken from a book. In the book, the character is approximately three-eighths of an inch high.

Video Signals

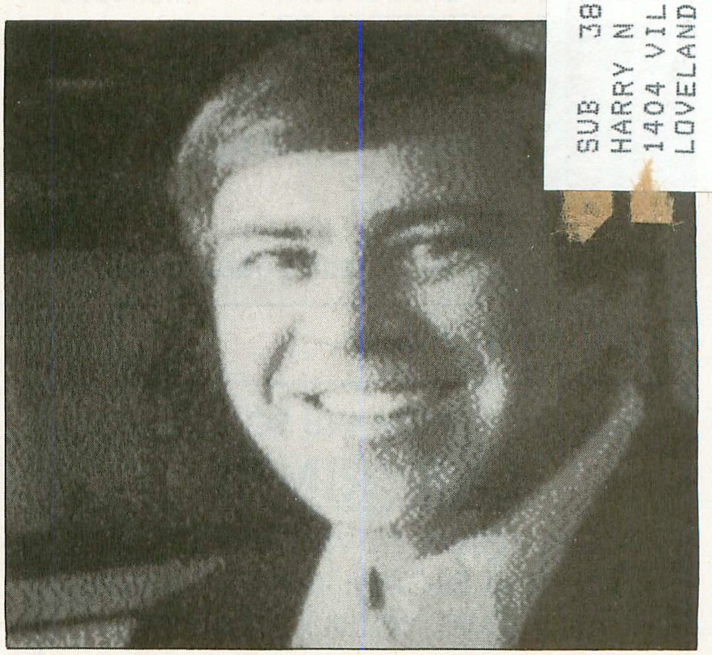
In case you haven't guessed, the digitization method used here is called *video digitizing*. Before telling you how it works, let me give you some background about television signals. . . .

A standard television signal is called "composite video." This is not the same type of off-the-air signal your television gets, but is the "stripped down" *video* signal. Composite video is the type of signal that goes into a monitor rather than a television receiver.

Composite video is generated in your CoCo 1, 2 or 3. In the CoCo 1 and 2 it's then *modulated*, or converted, to a signal that can be received on television channels 3 or 4. This step is necessary so that an ordinary television receiver can be used to receive the CoCo 1 or 2 color picture. The CoCo 3 is more sophisticated. The CoCo 3 can also use a standard television with 256-by-192 resolution, a *composite monitor*, or an RGB *analog monitor* like the CM-8. There are three separate outputs.

Look upon composite video as the "raw" video image generated by a television camera. The modulated rf video is the signal that goes out on the air as Channel 3 or Channel 4, either from the miniature modulator contained within your CoCo, or from the huge transmitters of your local television station.

Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years' experience in the industry covers a wide background: programming, systems analysis and managing projects for computers ranging from mainframes to micros.



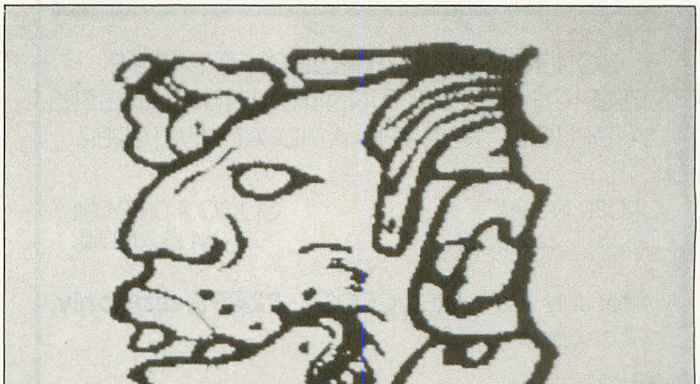


Figure 1 (top) and Figure 2

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To put things into better perspective, a composite video signal is the same type of video signal that comes out of the VIDEO OUT jacks of your VCR. You may never have used this signal unless you have a combination television receiver/monitor. If you look at your VCR, though, you'll see a *phono jack* with that labeling, as shown in Figure 3.

Camcorders, those expensive alternatives to the home movie camera, also have two types of output. One type is composite video, which can be used with a composite monitor. The second type is a modulated rf signal that can be received on an ordinary television receiver. Again, the modulated signal is nearly identical in format to the one from your CoCo phono jack that drives your color television receiver.

OK, got it straight? Composite video feeds into a composite monitor, and modulated rf is composite video that has been converted to Channel 3 or Channel 4 signal.

How Video Digitizers Work

Video digitizers take a composite video signal, such as the one you get out of your home camcorder or VCR, and convert the analog signal to digital. Figure 4 shows a representation of a portion of the composite signal. The wavy line represents the brightness along one horizontal line — either the brightness associated with a black-and-white picture or the luminance associated with a color picture.

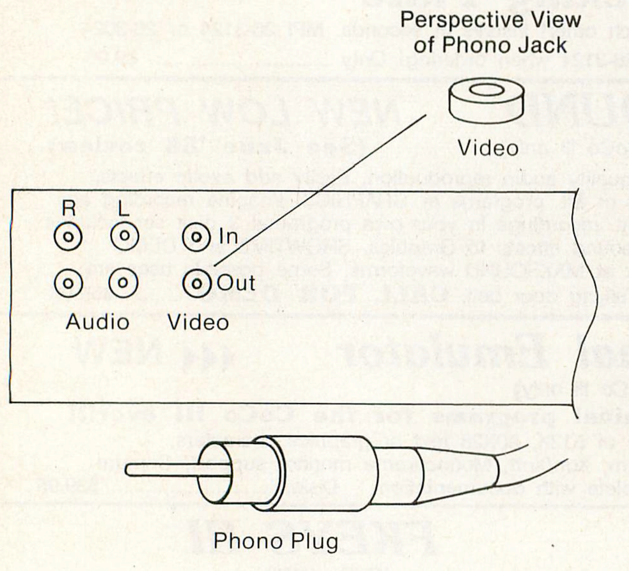


Figure 3: Phono Plugs and Jacks

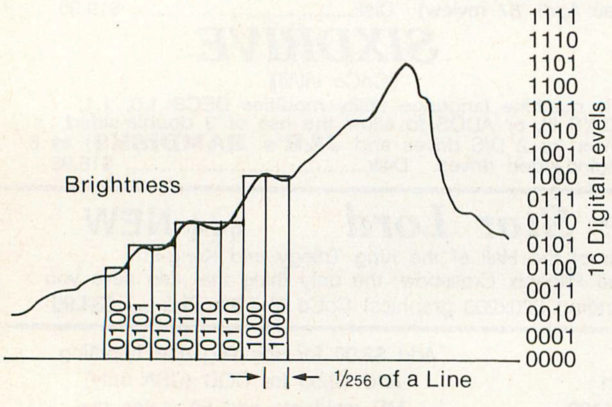


Figure 4: Digitization of a Composite Video Signal

Typical digitization is shown in the figure. A total of 256 samples across the line are digitized. This amounts to dividing the line into 256 steps. For each step, the height of the brightness signal is sampled and converted to a digital value. Why 256 steps? Any number of steps could be used, the more the better. However, the CoCo 1 and 2 can display only 256 pixels (picture elements) horizontally, so any more steps are overkill for those systems.

Now here's a problem: The analog brightness signal represents an *infinite* number of levels. One small step in brightness results in influencing the electron beam shot out toward the screen. However, to digitize the brightness level, we can't have an infinite number of levels. Two levels, on and off, would be all right for displaying text. It takes one bit to store two levels — a 0 and a 1 can be used. Four levels would give four brightness levels on the screen. It takes two bits to store the digital form of the four levels — 00, 01, 10 and 11. Eight levels would require three bits to store 000, 001, 010, 011, 100, 101, 110 and 111. Sixteen levels require four bits — 0000, 0001, 0010, 0011, 0100, 0101, 0110, 0111, 1000, 1001, 1010, 1011, 1100, 1101, 1110 and 1111. Although we'd like to have hundreds of levels, again, it's a kind of overkill — the human eye can't distinguish minute changes in brightness. Sixteen levels are a good compromise for digitization, and the four bits fit nicely into a byte of eight bits used in the CoCo.

This digitization process continues for all the screen lines of a composite video picture. A normal television picture has 525 lines. However, most VCRs and televisions are capable of a resolution of only 350 to 400 lines. This means, by the way, not that the screen will show only a partial picture, but that those lines will be spread over the screen from top to bottom. Again, the ideal is to digitize at least 525 lines, but since the original CoCo 1 and 2 display only 192 rows, 525 lines would be overkill.

A good compromise on digitization, then, is to digitize 256 pixels horizontally for each line, and to digitize 256 lines. Each pixel is digitized to 16 different levels, held in four bits. The result is 65,536 samples, each four bits. Since each sample can be held in one-half of a byte, it takes 32,768 bytes to hold all of the samples.

Another term for the 16 levels is "a gray scale of 16 levels," as each level represents a progressively darker shade of gray from white to black, at least for a black-and-white picture.

Putting It All Together

I wanted to start off digitizing as inexpensively as possible. Here's what I had to begin with:

- CoCo 3
- CM-8 monitor
- Two disk drives
- Y cable

After perusing the ads in THE RAINBOW, I settled on the least expensive Micro Works digitizer, the DS-69 with digitizing software, selling for $99.95. The DS-69 digitizes at a slower rate (two images per second) than the DS-69B (eight images per second). With the DS-69, I planned on using my VCR to generate a composite output for digitization. True, this would only allow me to digitize pictures from video tape, but I wanted to start small.

Thanks to the miracle of overnight delivery, I had the DS-

69 the next day. The DS-69 is a small interface, about the size of other CoCo ROM cartridges. It plugs into the cartridge slot on the side of the CoCo or into a Y cable, or so I thought. However, after reading over the Micro Works documentation, one thing was obvious — I needed a Multi-Pak interface. To verify this, I plugged in my Y cable and tried to run the software. The *C-See* software wouldn't recognize DS-69 while attached to the Y cable.

Ah well, I thought, so I buy a Multi-Pak interface. I had avoided the ugly Multi-Pak for some time. It made the CoCo 60 percent wider, and I was running out of room on my desks. I had to have one, however. Somewhere in the back of my mind, though, I remembered hearing something about the CoCo 3 and Multi-Paks. . . .

Firing up my communications program, I checked into Delphi and scanned for messages relating to the Multi-Pak on the Color Computer SIG. I found a bundle. I noted a reference to Marty Goodman's article on the subject in the January 1987 issue of RAINBOW and read that. It appeared that Multi-Paks and the CoCo 3 have some compatibility problems that can be (partially) solved by a repair center update to the Multi-Pak. In spite of potential problems, I paid a visit to my local Radio Shack and bought a new version of the Multi-Pak.

Plugging in the Multi-Pak, I tried it out. The disks appeared to be working properly in spite of the horror stories I had read. I tried running *C-See*, the Micro Works digitizer program. It also appeared to be working. I put the Multi-Pak update plans on hold.

My next problem was getting something to digitize. Although my original plans for using a VCR sounded good at the time, I couldn't really find any images that held still for several seconds at a time. My VCR is an older model and doesn't have freeze-frame. Besides, most VCRs, except for the newer digital models, freeze-frame poorly with "tear" lines across the bottom of the picture. I thought briefly of running a composite input from another computer to the phono jack input of the DS-69. That would work, but the program material wouldn't be that great.

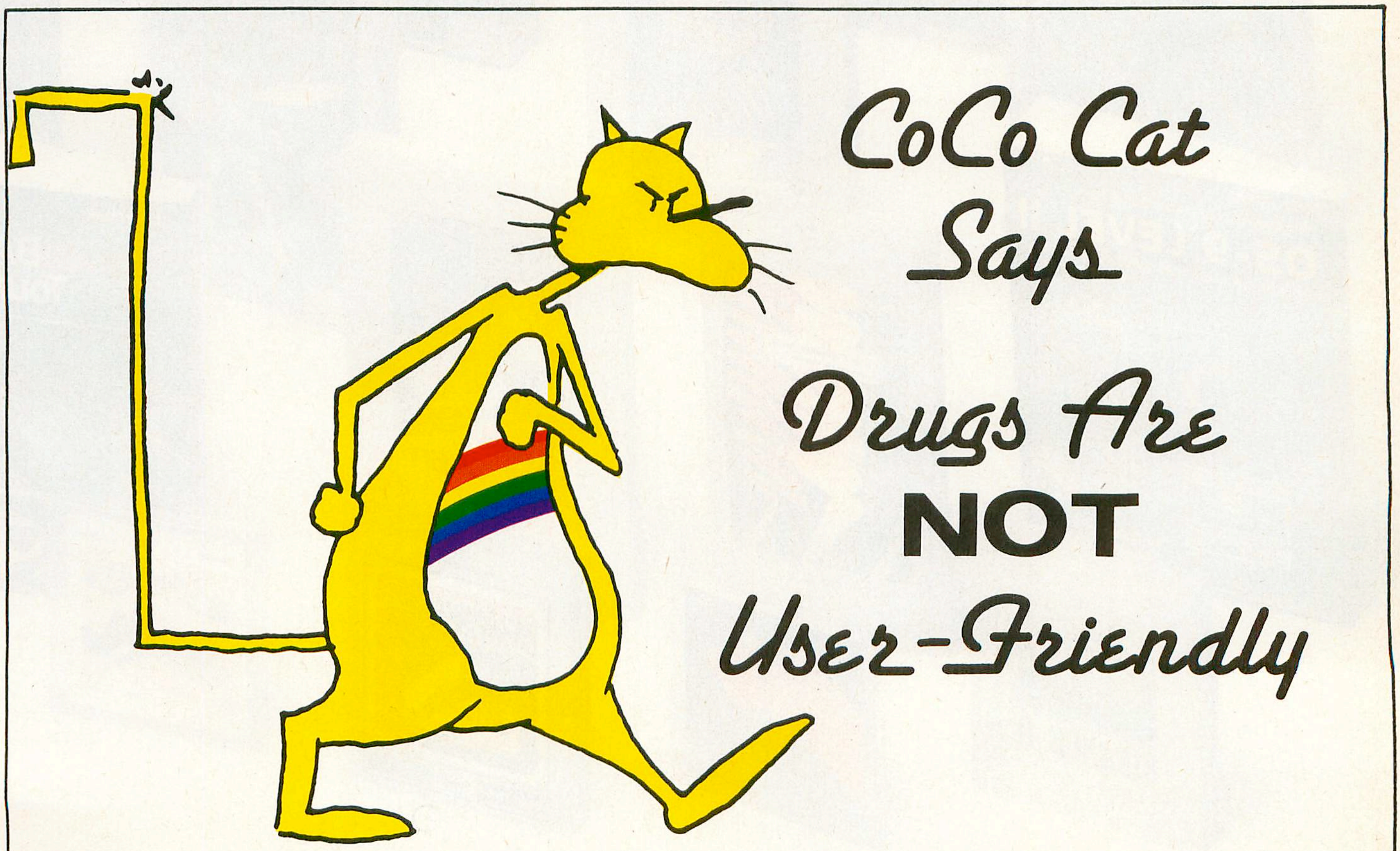
The only solution seemed to be to use a video camera. Unfortunately, I did not have a camcorder. I was waiting until the price dropped significantly below $1,000. Maybe a cheap monochrome camera, I thought . . . By now, my budget for the project had been shot to Hades (one DS-69 plus shipping plus one Multi-Pak came to $180), but I was in too deep.

I remembered that the ACP swap meet, a once-per-year extravaganza, was being held the next day, a Saturday. The next morning I rose early, carefully putting in my pocket protector and pens and strapping on my Ham Handy Talkie in my disguise as a computer nerd.

I saw several color camcorders at prices close to $1,000. But then, rounding a corner, I saw what I was looking for — a surplus industrial closed-circuit television camera. (These cameras generally have composite video output). Perfect, and for $35. Offering $40 (business has never been my strong point), I closed the deal and drove away.

On my way home, I made a detour to my friendly Radio Shack store and bought a converter plug to convert the BNC-type plug on the back of the camera to a phono jack. I also bought a video cable with phone plugs on each end.

At home, I tried out the camera on my large monitor/television, plugging the camera output into the VIDEO IN



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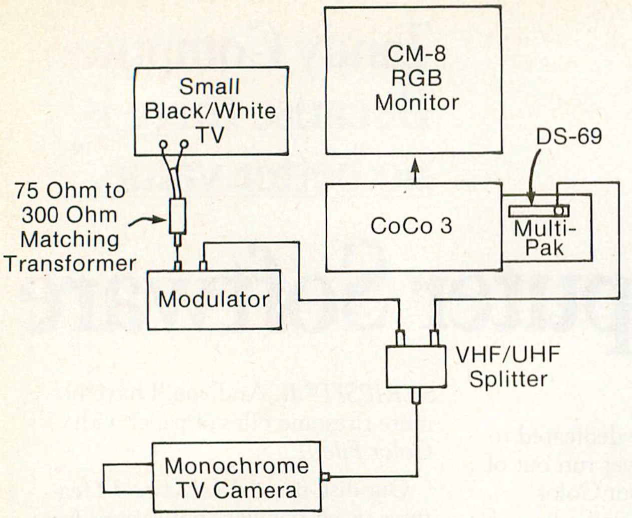

Figure 5: Final DS-69 Setup

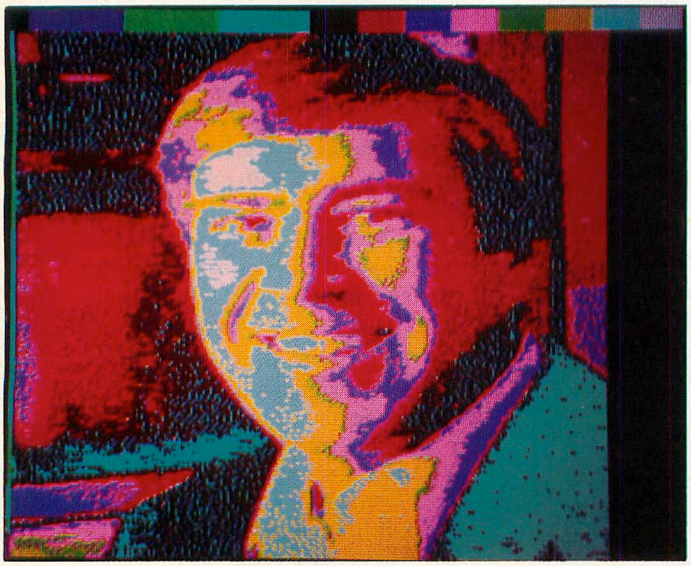

Figure 6

phone plug on the back of the set. The picture wasn't bad, but what was that wiggly, meandering line across the screen? Then I remembered. Walking through the crowds at the swap meet, I had inadvertently pointed the camera up in the air. Since camera tubes are sensitive to strong light, I must have burned the tube face by pointing the camera at the sun. *Another $35* wasted!

I regrouped. Checking around, I found that new monochrome cameras ranged in price from about $160 to $400 without lens. I located a supplier specializing in closed-circuit monochrome cameras and made the drive up to Anaheim. The demo camera was a Sanyo VCV1224 and had excellent resolution. I made the purchase, buying the camera without lens. My plan was to add a C-mount adapter so that I could use the lenses from my Canon camera. The C-mount adapter converts the screw-type fitting on the video camera so that a photographic lens can be mounted.

I now had everything I needed. I took the camera home, plugged it in (it uses 24 volts DC, a plus since the camera can be moved a distance away from any monitor), and ran the cable output from the camera to the DS-69 input. Aiming the camera at my bookcase, I realized that I was not yet done buying equipment! Although by trial and error I was able to focus the camera by watching the digitization on the screen of the CoCo, I needed some way of monitoring the picture from the camera. My CM-8 is an analog monitor and does not take composite video input, so that was out.

I considered the possibilities. I could buy a small television/monitor such as a Radio Shack Pocket TV, but unfortunately, the resolution on the inexpensive LCD models was not that good. I could buy a larger monitor, or I could use an existing TV and add a *modulator*. As described above, a modulator converts the composite video signal into a television signal that can be received on Channel 3 or Channel 4. Since I had a small black-and-white TV, I opted for the modulator, only $29.95 at the Shack. I also had to buy several cables and adapters to split the signal for the "monitor" and DS-69 input. The setup is shown in Figure 5.

After hooking everything up, I was ready to begin digitizing the world. . . .

What the *C-See* Software Sees

The basic task of the Micro Works *C-See* software is to control the digitizing of the video input. Digitized images can be displayed on the screen of the CoCo in black-and-white or color, saved on disk as files, retrieved from disk, or printed on a variety of Radio Shack printers. The brightness and contrast of the incoming video can be adjusted by the program, so that the software can compensate for lighting conditions used with the camera.

When displayed on the screen, 128-by-128 or 256-by-256 resolution can be used. Five levels of gray scale, 16 levels of gray scale, or color can be used for the display. The five levels of gray scale are digitized faster than 16 levels. The 16-level digitizing takes about 30 seconds in 256-by-256 mode. In all modes you can see the picture being digitized on the screen, and you can adjust the brightness and contrast.

The color display mode displays a "false color" imaging (see Figure 6). In this type of display, the 16 gray scale (brightness) levels of the picture are equated to 16 different colors and then displayed on the CoCo 3. You have complete control of which colors are used by palette controls in the software (there's a color bar at the top of the screen).

Figures 1 and 2 are taken off the CM-8, so you can see the exact way pictures are displayed on the CoCo screen. The figures are slightly squashed (I haven't gained *that* much weight), and the DS-69 has a width control that needs some adjustment. These pictures do not have the best contrast. Lighting is an important factor, and my lighting left something to be desired.

In addition to the screen display, you can also *print any* five-level or 16-level picture. The `CONFIG` (configuration) program for *C-See* lets you choose from a menu of Radio Shack and non-Radio Shack printers. Unfortunately, my DMP-130 is not included — I chose the DMP-100 option and got good graphics printout, but the picture was somewhat flattened.

Graphics Files

One of the things I'm interested in is processing the raw video data in the files. Lots of things can be done with the video data — software zoom and windowing, image recognition, and video enhancement.

C-See uses two types of video image files, a 128-by-128 file (8,192 bytes) and a 256-by-256 file (32,768 bytes). Data is held in these files the same way that data is held in memory during *C-See* operation. Video files can be accessed by BASIC

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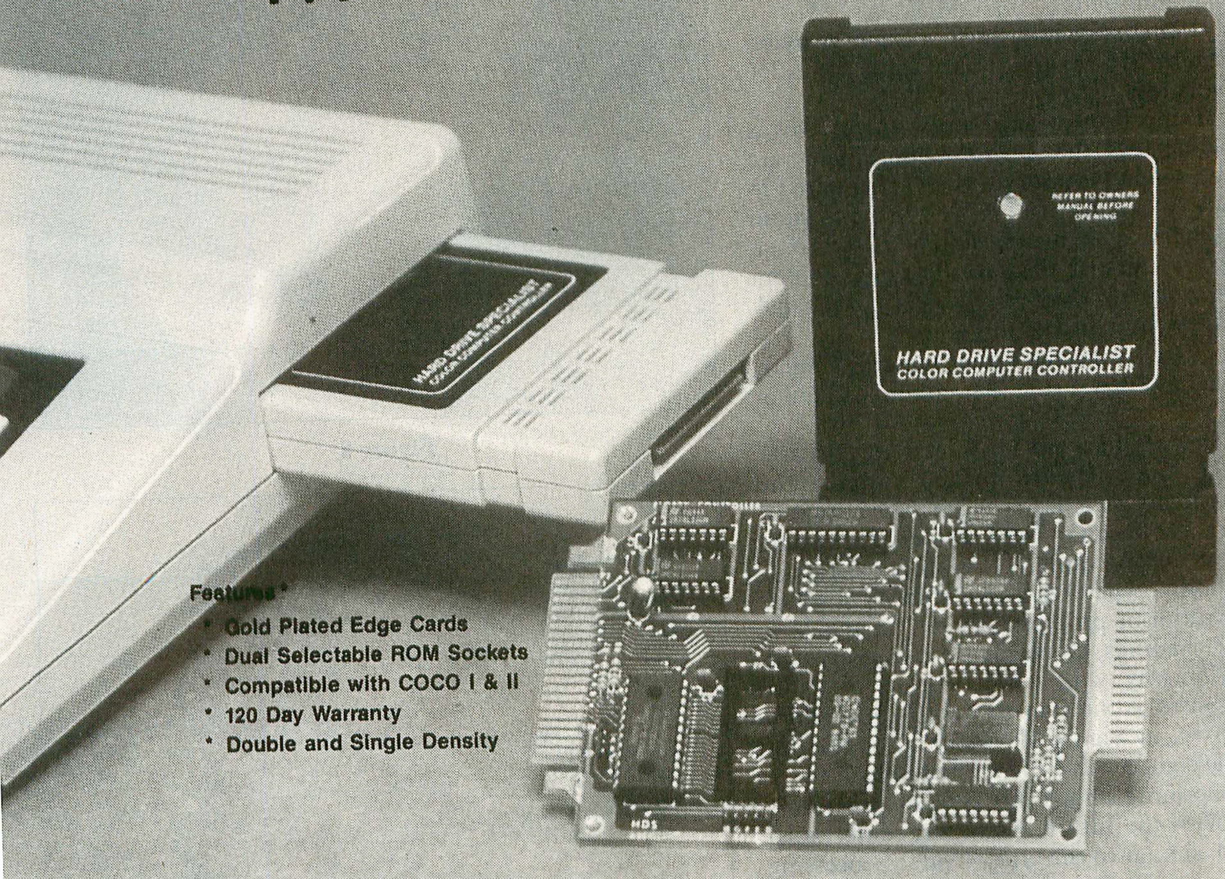
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programs or other languages to allow you to do your own processing.

Both the 128-by-128 files and the 256-by-256 files use 16 gray scales. As I mentioned before, 16 gray scales are represented by 16 four-bit binary values. These values, called "nibbles" by some, are 0000, 0001, 0010, 0011, 0100, 0101, 0110, 0111, 1000, 1001, 1010, 1011, 1100, 1101, 1110 and 1111. Each nibble takes one-half byte.

A 128-by-128-by-4-bit image takes 128 * 128 * ½ bytes, or 8,192 bytes. A 256-by-256-by-4-bit image takes 256 * 256 * ½ bytes, or 32,768 bytes.

These bytes are arranged in *column major* form. This is a fancy way of saying that the x and y coordinates are transposed from CoCo video memory format. There are 128 column values in the first column of a 128-by-128 digitization. The 64 bytes of column data are arranged in bytes 0 through 63 ($00 through $3F) of the disk file data. The next column is held in bytes 64 through 127 ($40 through $7F) of the disk file data. This arrangement is shown in Figure 7.

For 256-by-256 digitized data, the arrangement is similar, but each column takes 128 bytes (the first column is held in bytes 0 through $7F).

I am now using a Hewlett-Packard LaserJet Series II Laser Printer. Since the *C-See* software doesn't support the *LaserJet*, I had to write my own driver to take advantage of the 300-dots-per-inch resolution of the LaserJet. The results are shown in figures 8 and 9, which are printouts of figures 1 and 2. Each figure uses a type of *halftone* printing in which the 16 gray-scale levels print progressively darker points. I used eight gray-scale shadings, converting the 16 gray-scale levels to eight by dividing by two.

The half-tone process is similar to newspaper photo screenings and is shown in Figure 10, which gives the dot configurations for the eight levels from white to black.

Perhaps I can write more about this type of processing either next month or in the future. Some very interesting effects can be created, similar to the type of video processing that is done on television these days.

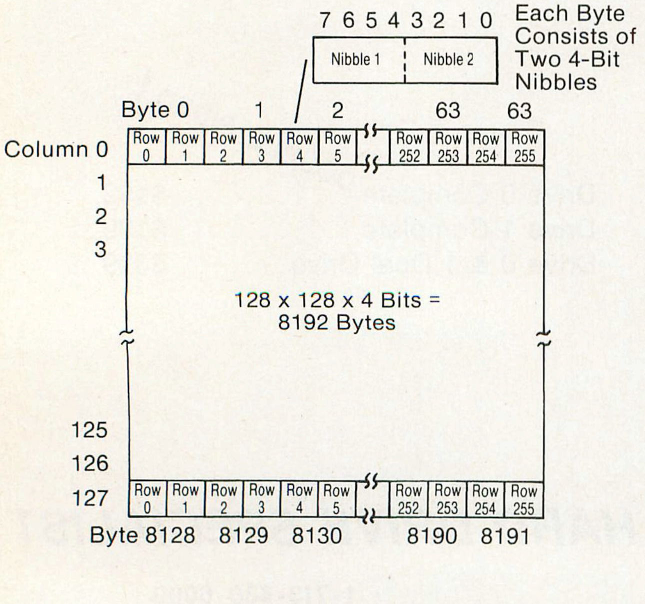

Figure 7: Video Image File Format

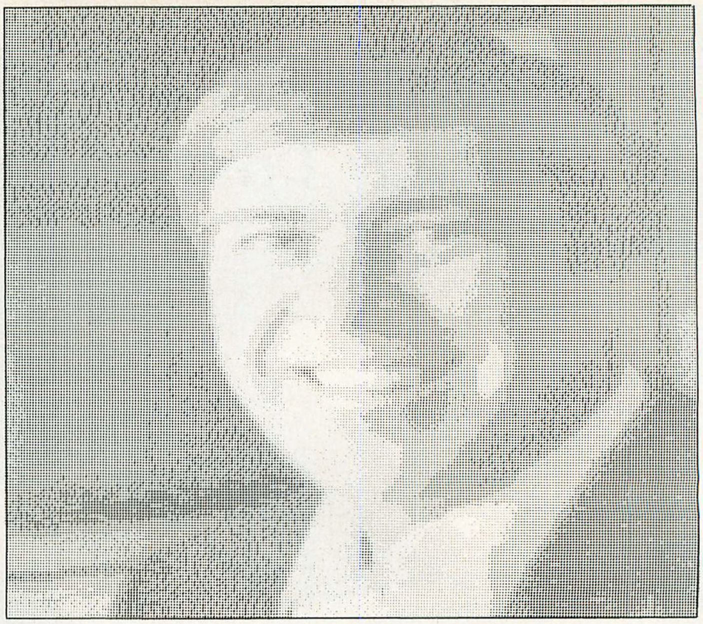

Figure 8

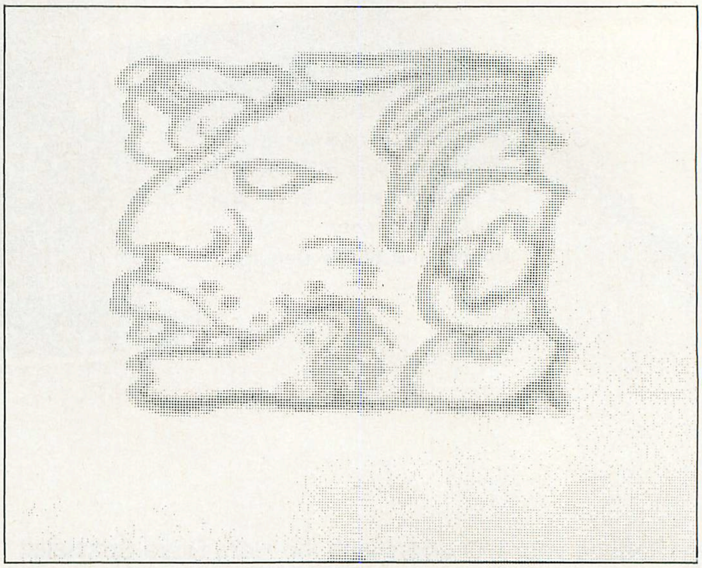

Figure 9

Thoughts About the Project and the DS-69

This is not really an objective review of the DS-69. From the time I saw the first digitization, I was hooked! The Micro Works hardware works as represented, the software is high-quality, and the documentation is adequate. I'm having a great time digitizing everything within camera range.

The digitization project turned out to be a little more expensive than first imagined. Here's a breakdown:

DS-69	$104.50
Multi-Pak	74.20
Monochrome camera	170.00
Modulator	31.75
Cables, adapters	18.75
	$399.20

If you have your own camcorder, monitor and Multi-Pak, you can probably get by for under $125. Even my expenditure, however, is relatively inexpensive when the prices of

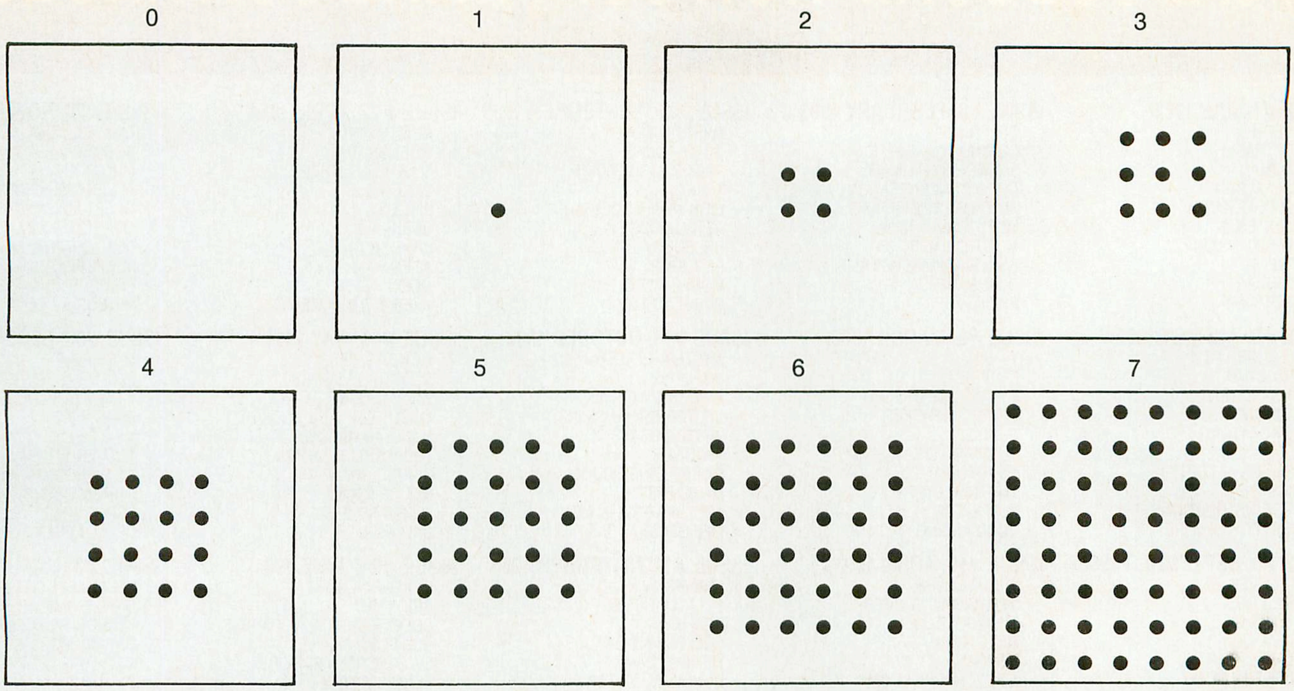

Figure 10: Half-Tone Shadings on the LaserJet

hardware and software for the Tandy 1000 systems and MS-DOS systems are considered. Once again, CoCo prices are a real bargain.

I showed my friend Ron, a dyed-in-the-wool IBM mainframe and IBM PC bigot, the results on the CoCo. He uttered the highest praise that such a person can give. "I'm impressed!" he said. So am I.

See you next month with more CoCo topics.

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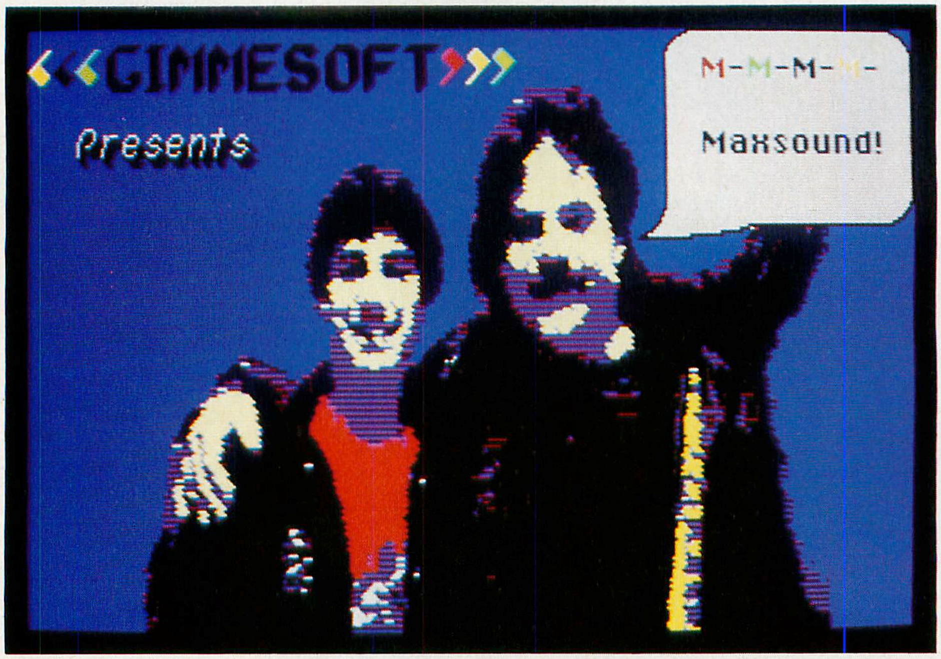


Tom DiMarco Sr. and his son, Tom DiMarco Jr., join in the fun in the demonstration program for Maxsound. *The demo shows how* Maxsound *can be used in conjunction with graphics.*

Software CoCo 3

Maxsound — Breaking the Sound Barrier

Eyes in the audience glow with wonder, and imaginations run rampant as the performance continues. No, it isn't a magician they are witnessing. Rather, it is *Maxsound*, an audio digitizer that is bringing a new era to the CoCo Community. But to many, *Maxsound is* magic in its own right.

Maxsound, written by Don Lucas of Lucas Industries 2000 and marketed exclusively through Gimmesoft, is a major commercial application of sound digitization for the Color Computer. Unlike other CoCo digitizers we've seen, *Maxsound* is designed to accept nearly any type of sound input and then allow the user to manipulate the digital sound image in memory.

When I first received the package, I was excited by the idea of digitized sound but at the same time somewhat skeptical. Surely the results couldn't be that great. And when I read the manual and learned there were so many options, I just *knew* this package was going to be too complex for most users (including me). But it would have been difficult for me to have been more wrong — I had a complete sample of digitized sound running 10 minutes after I opened the package (and that included creating a backup disk).

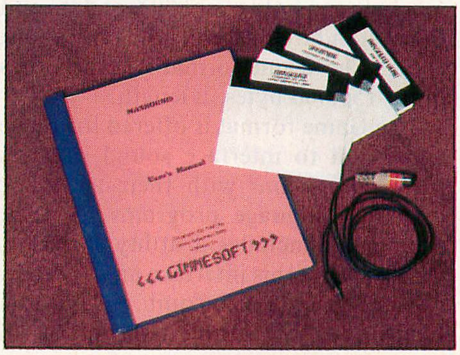
Maxsound is a hardware/software digital recorder/sequencer designed for 128K and 512K CoCo 3s. The package includes three disks, a complete user's manual and a cable to connect the CoCo 3 to an audio source. The software includes the *Maxsound* program, several utilities and plenty of demonstrations on how to gain the maximum benefit from *Maxsound*. Helpful examples showing how to interface digitized sound with BASIC and machine language programs are also provided.

Four main menus are used in *Maxsound*. Most of the "play" functions are included on menus 1 and 2, which give the user the ability to manually play the digitized sound. Menu 3 is referred to as the Disk Routines menu and allows for the loading and saving of sound files. The final menu is the Sequencer menu.

What are *Maxsound*'s capabilities? A sound sample you have recorded in memory can be played forward or backward at nearly any speed (speed is controlled using the Playback Delay option). This leads to some rather unusual effects. And the magic of it is that it takes only a few quick keystrokes to play the digitized sound in either direction. It surely beats ruining the stylus on your turntable by turning the record backward when looking for those "hidden messages."

Maxsound also allows the user to define the starting and ending points of the sound sample. So, if you record more than what you want or need into memory, you can change the size of that sample. In fact, you have control *down to the byte* over just what part of the digitized sample you want to keep. And then you can save it to disk or manipulate it further. To simplify the task of locating specific points in the sample, the user can simply press 0 (zero) while the sound is being replayed; the current memory location will be printed on the screen. This is important; in a 512K CoCo 3 the start and end points can take on values from 0 to 507,571. Trying to guess just where a certain point is would be difficult without this little addition.

Menu 1 includes an option for looping the sound sample. In other words, it is possible to have *Maxsound* continually cycle through the selected portion of the memory contents.



Another option offered on Menu 1 is Sampling Delay. Using this option to change the delay value alters the number of samples, or analog to digitial conversions, taken each second in the recording mode. The default value is zero, which sets up *Maxsound* for 15,000 samples per second. In a 512K machine, this allows for about 35 seconds of recorded sound. You can increase the amount of recording time available by decreasing the number of sound samples per second. The tradeoff is sound quality. It decreases as fewer samples are used and as the samples are taken farther apart in time. For speech,

Don Lucas
The Programmer Behind *Maxsound*

While many Color Computer users are willing to sit back and wait for someone else to provide the software, others do their best to realize the full potential of the machine. Don Lucas, of Alliance, Ohio, is just such a CoCo user. Don started with the CoCo back in 1984. He quickly became frustrated about the lack of support for the things he saw in the CoCo. Rather than accept that situation, he chose to do what he could to change it. Don says, "The things I wanted to do with my CoCo weren't available from others, so I taught myself everything I could about the system. If there wasn't a way to do something, I made a way to do it."

Being the hobbyist that he is, Don was probably the first CoCo enthusiast to actually computerize a car with a CoCo. He soon had his Datsun B-210 operating like Kitt in the TV series *Knight Rider*. Complete with front scanner and swishing sound effects, it was the basis for *Maxsound*. Because sound digitization was not supported by anyone else, and a *Knight Rider* car (Don calls his Datsun "Viper") wouldn't be complete without sound, Don found a way to do it.

As has been the case with other projects Don has worked on, the sound effects idea quickly grew into what we now know as *Maxsound*. Other contributing factors include Don's interest in music. "However," he says, " while I like music, I am most certainly not inclined to enter all that data." *Maxsound* gives him the ability to make the music sound the way he wants — without the fuss. Don adds, "Also, I think there are a lot of CoCo users out there who are really proud of their graphics creations. But adding PLAY statements is a little bothersome. *Maxsound* will allow them to *enhance* their graphics presentations with music. This just opens another creative avenue for those people."

Other projects Don has worked on include a CoCo-operated alarm system that not only tells you where the break-in occurred, but will follow the intruder as he moves through the building.

Tom Di Marco
The Founder of Gimmesoft

Gimmesoft was created in early 1987 as a direct outgrowth of the introduction of the Radio Shack Color Computer 3. Owner Tom DiMarco, Sr., had written several programs for his personal use. When the CoCo 3 was introduced, it became necessary to rewrite much of his software to work with the new machine. "The first program I modified was *FKeys*," he said. "Because I was involved with rewriting and also because of the opportunity created by the CoCo 3, I decided to market my work."

In May 1987 Gimmesoft attended its first RAINBOWfest. The company's product line at that time included *FKeys III*, *Custom Palette Designer* and *Six Drive*. Since that time, Gimmesoft has added several new products, including *Auto Dim*, MPI-CoCo Locking Plate and *V-Term*. Also, Gimmesoft's operation has expanded to include products offered by other third-party vendors.

Product design at Gimmesoft may be handled differently from that at most other companies. "I don't design things in order to sell them," DiMarco said. "The products we offer were created mostly for myself. I don't really sit back and try to dream up new products. However, we are always looking for possible additions to our product line from other vendors and especially from independent programmers." This is how Gimmesoft came to market *Maxsound*.

Don Lucas, programmer of *Maxsound*, and Gimmesoft arrived at a mutually beneficial agreement in order to provide the CoCo Community with the package. And this may very well open a new marketing area for Gimmesoft as well as create greater interest in the Color Computer as a professional tool. At the same time, there are those who see other aspects to *Maxsound*. DiMarco admits, "Well, I was a singer for 10 years, and I do dabble with the keyboard. All that aside, I love *Maxsound* and the kids love it, too. I'd really like to see someone write a game using all the capabilities of the package."

The future looks bright for this young company from Perry Hall, Maryland. Its product line is growing and the Community is buying. Yet one of the most important factors to success is the fun involved. And it is apparent that, while it is in a serious business, Gimmesoft hasn't lost sight of the old adage, "Half the fun is in getting there."

this isn't too important. However, with music samples, the user will want to use the greatest number of samples possible.

Menu 2, the Recorder Memory Status menu, offers control over the start and end points of the music sample as mentioned above. In addition, this menu allows the user to set up as many as seven jump point locations. After you define these, you simply press an associated number key to jump to any location in the sound sample as it is played.

The saving and loading of sound samples is handled through the Disk Routines menu. *Maxsound* allows the user to save samples in one of two formats: *Maxsound* or Game. The *Maxsound* format is used for files to be loaded back into *Maxsound* for further manipulation. To support the vast amount of memory available, this feature will prompt the user to change disks when the current disk is full. Keep in mind that a full recorder in a 512K machine can hold over 500K of data and that a standard disk can hold only about 156K. The Game format supports files up to 156,000 bytes in length.

The Game format is offered for those who want to interface sound samples from *Maxsound* with their BASIC or machine language programs. In fact, *Maxsound* includes a utility, *Interfac*, which makes this interface an easy task. I found *Interfac* to be quite easy to use. Learning a few simple concepts is all that is required, and most of the work is done for you. The manual contains a wealth of information to guide you. In addition, several examples are provided in the manual and on the included disks.

Other options on Menu 3 include Granules Free, Directory and Kill file. I feel these are good examples of the "small" things that make any program more user-friendly.

Once the user has become familiar with the way *Maxsound* works, he will want to move on to Menu 4, the Sequencer menu. It is here that *Maxsound* really comes to life.

Maxsound's sequencer allows manipulation of sound blocks taken from the recorder memory. First, the user defines up to 15 different sound blocks based

What's in a Sound?

As most people know, sound travels in waves. However, it is sometimes difficult to visualize what such a wave looks like.

A "picture" of a single sound wave is shown in Figure 1. Depicted there is one complete cycle, a very small portion of a sound indeed. To visualize sound, imagine several of these waves connected together, end-to-end.

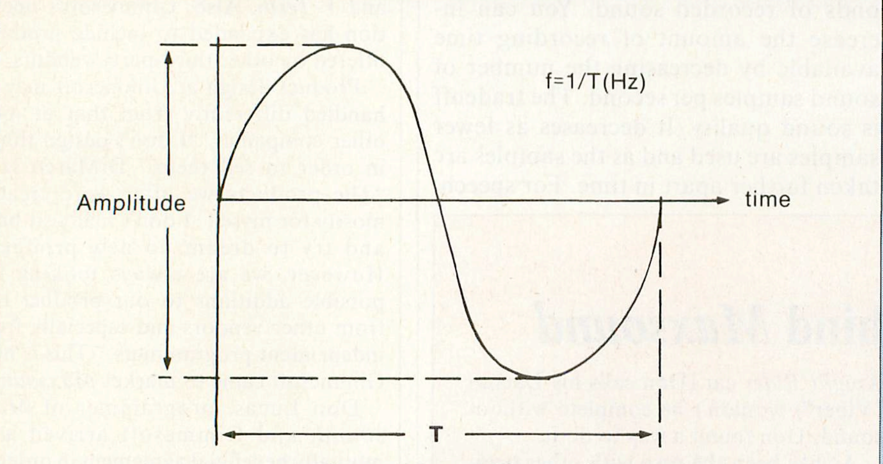


Figure 1: Sound Wave

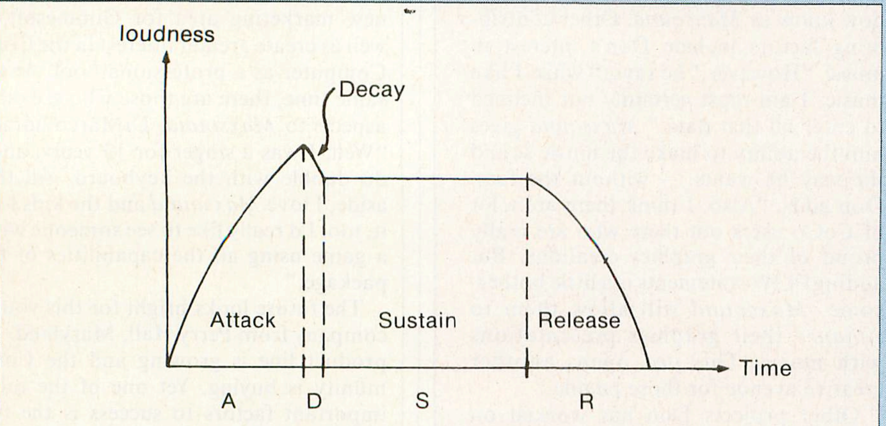


Figure 2: Sound Envelope (ADSR)

The *period* of a single wave is the time it takes for one cycle to be completed, represented by the variable *T*. On the flip side, the *frequency* (*f*) of a particular sound is the number of complete cycles that occur in exactly one second. This value is often given in cycles per second (cps) or Hertz (Hz). In simple terms, the greater the frequency, the higher the sound seems to the ear. As the vibrations causing the sound increase in speed, the *pitch* of the sound gets higher and higher. Mathematically, the frequency of a wave is the inverse of the period: $f=1/T$.

The height of the sound cycle shown in Figure 1 is called the amplitude. In simple terms, this refers to the volume or loudness of the sound in question.

Those familiar with acoustics know every sound has two characteristics that make it unique: the *envelope* and the *timbre* (sounds like "timber"). The envelope (shown in Figure 2) of a particular sound is often called its ADSR (Attack, Decay, Sustain and Release). This refers to how the loudness of the sound varies as time passes. For example, the sound of a door slamming shut usually has a very short envelope; the attack, decay, sustain and release happen very quickly. On the other hand, a bell usually has a very short attack, decay and sustain, but the release is very long; the sound of the bell dies away gradually.

Every musical pitch has associated with it several related higher pitches, as shown in Figure 3. The intended or primary pitch is called the *fundamental*. The "extraneous" pitches are known as *partials*. The relative amplitude (loudness) of each of these partials varies from musical instrument to instrument and from sound to sound. This is known as on the starting and ending addresses for each desired block. This is accomplished by altering the memory using Menu 2. Once the blocks are determined, the user tells the sequencer the order in which to play the blocks. Because repetition is common in music and sound, this allows a great deal of flexibility while using as little memory as possible. A very good example of the use of *Maxsound*'s sequencer with a music sample is described in the manual. The sequencer's possibilities are limited only by your imagination.

I was told by Gimmesoft's Tom DiMarco, Sr., that a newer version of *Maxsound*, now being shipped, includes an echo feature as well as data compression. Needless to say, these additions will only enhance *Maxsound*'s usefulness. Unfortunately, because of time limitations, I did not have a copy of the newer version for reviewing purposes.

For this review, I used several of my own sound samples in addition to those provided with *Maxsound*. Some of the samples were of a musical nature while others were strictly voice. At the present, *Maxsound* does work better with voice than with most music. In general, music contains frequencies that are too high for *Maxsound* to reproduce without some audible distortion. The applied rule of thumb is that distortion doesn't become a major factor until the frequency of the input signal becomes higher than half the number of samples taken per second. This limits *Maxsound* to about 7500Hz. *Maxsound* isn't to be blamed for the speed limitations of the Color Computer, however. And I was actually impressed by how little distortion was present, considering that some of the samples I used contained frequencies well in excess of 7500Hz.

Maxsound allows the Color Computer to serve as a central part of a home recording studio. As a musician, I found that its capabilities enhanced my work by freeing me from more mundane tasks. It allowed me to more fully take advantage of my creativity. You don't have to be a musician or sound engineer to enjoy *Maxsound*. It is just plain fun to use! And it's easy, too.

But a little knowledge of sound wouldn't hurt. In fact, an understanding of such things as timbre and the sound envelope will help you push *Maxsound* to the limits, whether in imitating an orchestral instrument or creating your own special effects. If you're interested in digging deeper into *Maxsound*, see the sidebar "What's In a Sound?" for an introduction to the mechanical properties of sound.

Maxsound is one of the few Color Computer products I have used that I felt to be complete. The manual is well-written, and the software is well-designed and very user-friendly. While I had no problems with *Maxsound*, I did have occasion to call both Gimmesoft and Don Lucas. In both cases, I was impressed by the amount of support they are willing to provide. I have no reservations recommending *Maxsound* to any CoCo user — for serious applications or simple fun.

(Gimmesoft, P.O. Box 421, Perry Hall, MD 21128; 301-256-7558; $59.95 plus $3 S/H)

— Cray Augsburg
Rainbow Technical Editor

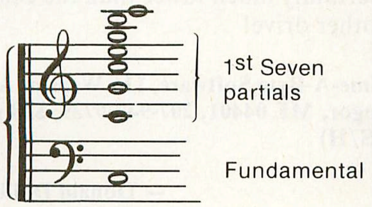


Figure 3: Major partials for a C3 fundamental.

the timbre of the sound and accounts for why different sounds sound different. A trumpet sounds different from a flute. The flute sound is almost pure; the partials are not very loud. A trumpet, on the other hand, is fairly rich in harmonics; the associated partials are louder.

This gives the trumpet a more distorted (the polite term is "brassy") sound as the partials tend to fight with each other, causing confusion for the human ear. The timbre of a particular sound or instrument is very important. Without it, everything would sound pretty much the same. And quite a few professional musicians would be out of their jobs.

Now when the ADSR and timbre are taken into account, the resultant sound wave looks less and less like that in Figure 1. This is complicated by many other characteristics of the instrument (voice or music) used to create the sound. However, the complex way in which each of these characteristics interact is beyond the scope of this text. Several books have been written on the subject. If you are interested in learning more, you might want to visit your local library or book store.

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Software CoCo 3

CCRAM — A Second Drive Via Software

So you recently bought a CoCo 3 and perhaps have upgraded to 512K, but the family budget won't allow much more. You're able to use the old disk drive system and can get OS-9 Level I up and running, but you have only one drive and, as everyone (including yourself) keeps saying — you need two drives for OS-9 to really shine. For a fairly low cost you can get that second drive via software. *CCRAM* is a RAM disk program available for OS-9 Level I, Version 2.00, running on a 512K CoCo.

Just what is a RAM disk, you ask? A RAM disk is simply a portion of memory configured to "look" like a disk drive. *CCRAM* consists of two modules: the device driver, *CCRAM*; and the device descriptor, R0. After loading these modules into an OS-9 Level I system and formatting with the standard OS-9 format command, you will have 1,792 sectors. As a standard 35-track disk contains 630 sectors, the RAM disk is roughly equivalent to three disks.

Once the RAM disk is loaded and formatted, it is used in the same fashion as a regular disk drive. You can do a `dir /r0`, a `cd /r0`, etc. For really fast operation, you can move the `CMDS` directory to `/r0/CMDS` (use `MakDir` to create `/r0/CMDS`). For those with the C compiler, you can really speed up those long compilation processes using *CCRAM*.

CCRAM comes with several shell scripts that assist the user in installing *CCRAM* as well as show how to make a new *OS9Boot* with *CCRAM* incorporated into the boot file. The documentation consists of four pages of step-by-step instructions.

Overall, *CCRAM* performed as expected for a RAM disk. It worked fine with my "plain vanilla" OS-9 system as provided by Tandy, but, unfortunately, did not work with my modified system, which includes an 80-column screen. I suspect there is a memory conflict between the screen and the RAM disk. This is not a fault of the author, but it is disappointing. The price may seem a bit high for this type of product, but it is certainly much lower than the cost of another drive!

(Dime-A-Byte Software, 116 Webster Ave., Bangor, ME 04401, 207-942-0739; $28 plus $2 S/H)

— Donald Dollberg

Software CoCo 1, 2 & 3

Disk Editor II — Doctor Your Disks

Disk Editor II is a handy utility you can use to modify a disk. It will handle both RS-DOS and OS-9 disks and works with all versions of the Color Computer.

When you start the program, you are asked for the track you want to begin editing. The screen then changes, displaying on the top of the screen the current half-sector to be edited. Editing commands appear on the bottom portion.

Using *Disk Editor II* is much like using a word processor on a small file. A cursor appears at the top of the screen and may be moved by the arrow keys. Pressing the CTRL key toggles between insert and typeover modes. The CLEAR key deletes characters under the cursor. It's easy to change each byte by typing the appropriate information from the keyboard. Pressing the @ key changes the byte digitally. To move along to the next half of the sector, simply press RETURN.

Along with its simplicity, there are some drawbacks. When you move

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through the sectors, the editor always goes forward. To go back to a previous sector, you have to press BREAK to return to the main screen, reenter the track number, and start again from the beginning of the track. The editor could use both a forward and reverse. There are no search features, either. If you have a particular string in mind, you have to search for it half-sector by half-sector. Needless to say, this can become time-consuming.

The documentation can be scrolled on the screen or dumped to a printer, but it looks a lot better on the screen — it came out looking like gobbledygook on my printer. The author should provide printed documentation, or at least an ASCII `README` file that can be more neatly printed. Although the documentation was adequate for describing the program's operation, someone not familiar with disk editing may have trouble.

To test *Disk Editor II*, I tried one of the more "fun" uses of a disk editor — modifying a machine language text game. *Dallas Quest* will never be quite the same. All the characters now address me by name, and I control everything J.R. says.

(Saint John Gallery, P.O. Box 613, Mount Sinai, NY 11766, 516-928-6991; $18 plus $1.75 S/H)

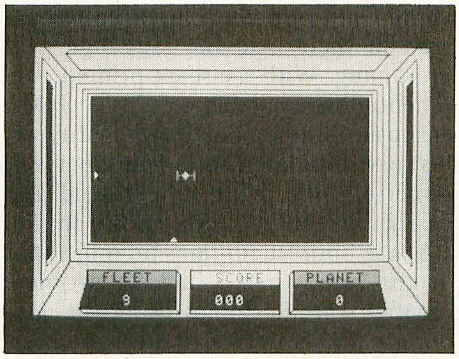
— Mark Haverstock

Software CoCo 3

Zandar — Watch Out, Luke Skywalker

Now that my gunfighting days are over, the thought of taking on yet another fast-draw video game normally fills me with horror. *Zandar*, by K-Soft, is different. Oh, sure, you have the usual display of the spacecraft's weapons, and your joystick is at the ready. But the joystick — instead of controlling a moving blip or crosshair — controls two arrows, one on the vertical edge, the other on the bottom horizontal.

Unless you stand across the room, you really can't see both arrows at once, so, while looking at one arrow and the moving target, you have to sense where the other arrow is. It's sort of like the scene in *Star Wars* where a blindfolded Luke Skywalker learns to go with the Force rather than fight it. In fact, it's a lot like that.



This non-protected disk program is, unfortunately, only for the CoCo 3. The startup menus allow you to choose a color TV or RGB monitor, enter your name for scorekeeping and select one of three difficulty levels.

The disk must be left in the drive, because scores will be posted to it. The primary differences between difficulty levels are the number of planets to the final destination, the number of bad guys between planets, the number of laser bolts you have at the beginning, and the laser bonus you receive when passing a planet. In other words, Luke, the higher the level, the tougher it is.

If you're not good enough at controlling the "force," you just may run out of ammunition well before reaching your destination. Getting stuck without ammo puts a galactic warrior in the unenviable position of watching as drones destroy his nine-ship fleet. Yeah, this happened to me, the guy who should have practiced more at the easier

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levels before tackling Expert. Obi-wan Kenobi need not fear competition from me.

The 80-column graphics are nice even on a color TV and could be spectacular on an RGB monitor. At least one of the enemy spacecraft looks a little *familiar*, but how many possible spaceship designs are there, anyway?

All in all, I like this game a lot. It will take some time to really get good at it, and leaving it alone for a while will undoubtedly mean a considerable decrease in ability.

In the meantime, does anybody know Yoda's address or telephone number?

(K-Soft, 300 13th NE, E. Wenatchee, WA 98802, 509-884-0338; $24.95)

— John M. Hebert

Book CoCo 3

Assembly Language Programming For The CoCo 3 — ML Reference for the CoCo 3

A few short years ago, Laurence Tepolt and TEPCO Publishing produced a book for CoCo 1 and 2 machine language programmers and enthusiasts. That book, *Assembly Language Programming for the TRS-80 Color Computer*, has since become one of the standard references on the subject. Now, Mr. Tepolt has written an addendum in the form of a 59-page booklet titled *Assembly Language Programming For The CoCo 3*.

This book gets right down to business with an overview of the MC68B09E microprocessor and the ways in which it differs from its predecessor, the MC6809E. The overview includes a brief discussion of new interrupts, display modes, I/O connectors and the GIME chip.

In Chapter 2, the author goes into detail on color definition, monitors and generation of the available colors. Physical and virtual memory is the subject of Chapter 3, with explanations of memory management and memory mapping in the CoCo 3 as the main topics. Other chapters cover interrupts, and Hi-Res and Lo-Res displays. Plus, there is a general "other subjects" discussion. The chapter on high resolution displays is given particularly detailed coverage.

The wealth of diagrams and charts should provide users with important aids in their machine language programming. With the scant printed documentation available to CoCo 3 ML enthusiasts, this book should prove to be very popular. The text is clear and concise, with print styles large and easily readable. I was surprised to find that the booklet contains no index, but at the same time I had no problem locating specific topics using the contents page. However, there is a cross-reference of control registers and page numbers.

Overall, this is a nicely done and well-written document. It should not be considered a stand-alone product, however, but one that serves as an additional reference for CoCo programmers already possessing some ML programming knowledge.

(Tepco, 68 James Court, Portsmouth, RI 02871, 401-848-0656; $12 plus $1 S/H)

— Leonard Hyre

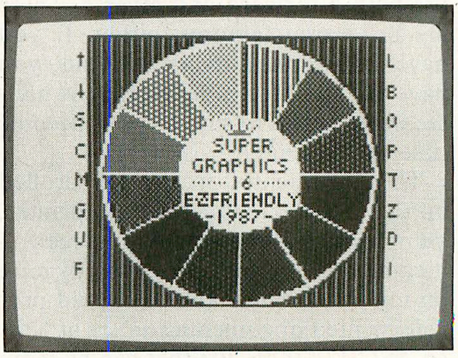
Software CoCo 2 & 3

Super Graphics 16 — Graphics for Starving CoCo Artists

Super Graphics-16 is a drawing program that combines some of the features of more expensive programs at an unbelievable price. Although it requires Extended Color BASIC, it uses only 16K of memory. You'll need a joystick, but no other interfaces or cables are required.

After the program is booted, the title screen appears, along with an alphabet soup of letters down either side of the screen. Pressing the CLEAR key removes the title screen, and you're ready to begin to draw.

The functions on this program are keyboard-oriented, hence the letters on the side of the screen. No icons or pull-down menus are present. If you want to change colors, for example, you press C to bring up the list of four drawing colors available. Other options include Drawing Speed, Fat Bits, Get, Put, Undo, Line, Box, Circle, Paint (27 colors), Text, and an Input/Output function for saving, loading and printing pictures. Disk users have three additional functions available: Flip, Zoom and a Palette of dot colors.



Super Graphics-16 is simple to use, and the directions are easy to understand. When you're running the program for the first few times, I suggest you keep handy the option list at the back of the manual until you get used to the letter commands. Be aware that each time you execute one of the options, you are automatically returned to the Draw mode. For instance, to make two boxes, you'd need to choose the B option twice.

Pictures can be saved to and loaded from the program disk, but I recommend using a separate picture disk. The program does give screen prompts for changing disks.

Printing your artwork is simple, but there are some limitations. First of all, the program was written for Radio Shack DMP-105/106 printers. As the screen dump routine was written in BASIC, it can be rewritten for most printers. However, I feel this might be a problem for inexperienced users and that drivers for the more popular printers should have been included.

Resolution in the print mode is not exceptional, as it relies on block graphics. Fortunately, the author chose to have them printed in condensed mode. This provides a little more detail, but not the detail of dot-addressable graphics. Print time was not particularly fast; at 600 baud, a dump of the title screen took about 11½ minutes on my Star SG-10.

CoCo 3 owners will find that the printer dump does not work on their computers. I was greeted with a "Printer is off" message every time I tried to print using the CoCo 3, even though the printer was online. I have been notified that the author has fixed this bug, however. The rest of the program works fine, provided you use a composite color monitor. An RGB monitor provides some very strange color combinations.

At $16, the program is a bargain for the starving CoCo artist. It's not a *Color Max* or *CoCo Max*, but the fact that it doesn't have any special hardware requirements and needs only 16K of memory makes it an attractive buy. I recommend it for CoCo 1 and 2 owners who want a basic and easy-to-use drawing program.

(E.Z. Friendly Software, Hutton & Orchard Streets, Rhinecliff, NY 12574; disk, $16 plus $1.50 S/H; tape, $12 plus $1.50 S/H)

— Mark Haverstock

Software CoCo 3

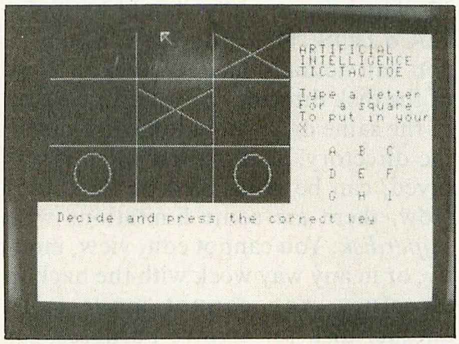
Artificial Intelligence Tic-Tac-Toe — Learning Can Be Fun

Playing tic-tac-toe on a personal computer is nothing new. In fact, computerized tic-tac-toe was probably one of the first games ever developed for the personal computer. The new twist in this version, *Artificial Intelligence Tic-Tac-Toe*, however, is that it is designed to be an exercise in AI (artificial intelligence). In short, the computer starts off as a rather "dumb" opponent, but as more rounds of the game are played, it gets "smarter." The primary purpose of this program is to teach the CoCo 3 to play tic-tac-toe.

If Archerware, the company behind *AI Tic-Tac-Toe*, were simply trying to market a colorful tic-tac-toe program with optional embedded speech for the CoCo 3, it certainly wouldn't sell many copies at the asking price of $29.95. But that's not all there is to the package. What Archerware is really selling under the name of *Artificial Intelligence Tic-Tac-Toe* is a tutorial on AI and its implementation on the CoCo 3.

AI Tic-Tac-Toe began as a science fair project. And like most science fair projects I know of, a lot of research and study went into it. Much of the author's research is included in the documentation. Also included is a highly detailed flow chart of the program and a hard copy of the author's BASIC programming code. The source code for one of the machine language routines, used to speed up the processing, is not provided. However, the majority of the program is in BASIC, and valuable information on AI programming can be gleaned from a careful study of its flow charts and BASIC subroutines.

AI Tic-Tac-Toe is targeted to a limited audience — those who want to learn more about the development and methods of implementation of artificial intelligence — although it does make for a nice game on the CoCo 3.



```
ARTIFICIAL
INTELLIGENCE
TIC-TAC-TOE

Type a letter
For a square
To put in your
X.

   A  B  C
   D  E  F
   G  H  I

Decide and press the correct key
```

AI Tic-Tac-Toe works on the CoCo 3 with at least one disk drive. Support is provided for the optional use of a joystick or mouse and a Radio Shack Speech/Sound cartridge.

Curious about how the program did in the science fair? Well, according to the author, in the mathematics, engineering and computer division, it took the grand prize. It placed second in the Junior Engineering Society category, and grand prize overall for the middle division — a job very well done.

(Archerware, 1602 Aster Street, Beaufort, SC 29902, 803-524-9452; $29.95: First product review for this company appearing in THE RAINBOW.)

— Kerry Armstrong

Software CoCo 1, 2 & 3

CoCo Address Book — Maintain Mailing Lists

Have lots of friends? A big Christmas card list? A mailing list of any type to maintain? If so, *CoCo Address Book* may be just what you've been looking for. This program allows you to manipulate names and addresses, along with telephone numbers and free-form remarks, for up to 100 entries in each of multiple files on one disk. It is extremely easy to use, provides a number of thoughtful features, and the documentation is excellent.

To use *CoCo Address Book* you need one disk drive and a CoCo 1, 2 or 3 with a minimum of 32K. A printer and an additional disk drive are useful, although not necessary. The program is not copy-protected and is written entirely in BASIC, which makes it easy to modify.

CoCo Address Book offers a number of standard features, and there are menu options for adding, deleting and updating records. The fields consist of first and last names, title, street address, apartment number, city, state, ZIP code, telephone number and remarks. Once entered, this information can be edited at any time; and the entire file can be sorted in alphabetical order by last name.

There is a search option, which enables you to locate specified entries in these fields: last name, city, state, ZIP code, area code and remarks. Another handy feature is the ability to maintain a number of separate files on any one disk. When the program begins, it asks if you want to work on a new or existing file. If you want an existing one, a list of available files to choose from is displayed. While working on one file, you can change to another from the main menu.

Still another useful function is the ability to review the file one record at a time. After displaying each entry, you can choose to print a label, edit, delete, go on to the next entry or return to the main menu.

Without question the strongest element of *CoCo Address Book* is the documentation. The user's manual is clear, concise, complete and entirely accurate. Each feature of the program is covered, and no attempt is made to artificially "pump up" the program. In fact, the author points out potential problems (and how to avoid and solve them). The first section of the manual is a walk-through of all the features and is easy reading. When I first opened the package, I read through the manual and knew exactly what the program would do, even before I turned on my computer.

Following the walk-through are three sample sessions, which thoroughly illustrate actual use of the program's features. Two appendices complete the manual, the first a list of U.S. state and Canadian province abbreviations and the second a quick reference sheet showing all the program's constraints, such as maximum records per file, etc.

There are a number of weaknesses in *CoCo Address Book* that I found annoying. Several are also quite restrictive, such as the maximum of 100 records per file and field sizes that are frequently too small. Twelve characters maximum for a city name is insufficient for certain out-of-the-way places like San Francisco or Oklahoma City. Twenty characters into the street address field I was brought up short when I tried to enter "1400 Arroyo Grande Dr."

When printing labels, the program does not ask you for your printer baud rate, nor does it print a test pattern to let you align your labels. It simply starts printing with the first record and doesn't stop until it reaches the end of the file. Should you have a paper jam or other printing difficulty, there is no way to interrupt printing and resume at a specified point.

In spite of these few shortcomings, though, I found *CoCo Address Book* to be a quality program, simple and effective to use, and well worth the asking price.

(Bob's Software, P.O. Box 391, Cleveland, OH 44107, 216-871-8858; $20 plus $2.50 S/H)

— Jim K. Issel

Software CoCo 1, 2 & 3

Superdisk Utility — Simplifies Disk Maintenance

Superdisk Utility is a utility package that acts as a DOS shell, allowing DOS operations to be selected and executed from its main menu screen. From the shell, you can run programs; back up files, directories or disks; examine or edit the contents of files on a bit-by-bit basis in ASCII and hexadecimal; kill (delete) files and print a directory. There are also options to name and date a disk, and to determine machine language start, end and execute locations. All these features are just a representative sampling of *Superdisk*'s capabilities.

I call the program a "mini DOS" because each option from the main menu in turn calls a program that has its own menu of choices. The value of *Superdisk* is in its user-friendliness — it is very easy to operate and simply structured, and it makes disk file maintenance easier to live with.

I tested all of the programs thoroughly, examined each feature and attempted to stump the program, but I could not crash it. *Superdisk* worked properly every time, even under adverse conditions. I had *Superdisk* read a disk on which the directory was *not* on Track 17, where it normally should be under CoCo DOS. This program is a gem — you can actually make a backup copy of the disk directory on an unused area of the same disk; should the disk crash, the directory, as it existed when it was saved, can be reinstalled on Track 17. Now, there are some limitations with *Superdisk*. You cannot edit, view, modify, or in any way work with the backup directory. You cannot move it to another disk for archive purposes, for example.

There are two version of this utility program, one for CoCos 1 and 2 (*Superdisk*), the other for the CoCo 3 (*Superdisk +3*). Both are included in the purchase price and come on a single disk. While the two programs are functionally identical, there are two differences. First, CoCo 3 users get a Hi-Res screen with upper- and lowercase letters, as opposed to Lo-Res for CoCos 1 and 2. Second, the program runs twice as fast on the CoCo 3 — a startling and welcome enhancement to the program, though I attribute this to the new CoCo's faster processing and not necessarily to the software.

Superdisk Utility also has a hardware element: a code plug, which when inserted into the right joystick port makes the program operable. *Superdisk* cannot run without it, so if you are using another program that requires a mouse or joystick in the right port, the two programs will not work simultaneously.

The *Superdisk Utility* package comes with a five-page set of photocopied instructions, in which each of *Superdisk*'s features is explained; and a small sample program is provided to let you "autoload" *Superdisk*. Although the manual does not differentiate between *Superdisk*'s two versions, it does a satisfactory job of explaining the program's features. There are more than a few typing errors, but they are only of annoyance value and will cause no confusion. I do think the manual should remind the user to remove the code plug on program shutdown, as other programs will not like it.

All in all, the *Superdisk Utility* package is an excellent value, and I would recommend it to anyone who wants to make disk file-handling a welcome relief instead of a tedious chore.

(Sunrise Software, 8901 NW 26 St., Sunrise, FL 33322; $19.95 plus $2 S/H)

— Jeffrey S. Parker

Software CoCo 3

Sub Battle Simulator — War Under the Seas

In *Sub Battle Simulator* for the CoCo 3, your goal is to command a World War II submarine, complete a mission and return safely to port. Your initial action in this Simulation can take place in any of three modes: target practice against an enemy convoy, single mission in a real combat setting, and wartime command over the course of the entire war.

There are 60 different missions (24 American, 36 German) in addition to the target practice mode. While American missions are very close to historical accounts, German missions are not as exact, as most of the patrol records were destroyed after the war.

Although the program is written in OS-9 Level II, you do not need a Level II system disk to run it — you just have to type `DOS`. Everything you need is on the disk and ready to go. *Sub Battle Simulator* is a refreshing diversion from the popular airplane Simulations. In *Sub Battle*, you have more of a chance to think before you react. The pace is slower, like the fox sneaking up on the henhouse; but battle, when it breaks out, is fast and furious.

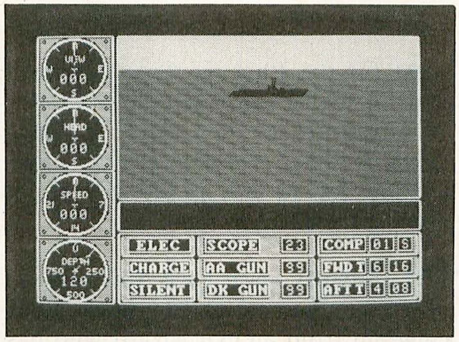
If you are on the surface and get too close to enemy ships or planes, you will see splashes of water as the shells hit near your sub. If you can sneak up on the enemy, raise your periscope and launch a torpedo or two, you will see the characteristic V-shaped tail as it approaches and hits the target. I was somewhat disappointed with the jerky animation of the torpedo traces — I would have expected better of an OS-9 program. Antiaircraft fire is more smoothly animated, though, and has tracers to assist your aim. The radar and sonar displays are realistic and useful in locating the enemy.

Sub Battle is played in real time, which means you could sit for hours doing nothing but cruising around the ocean in search of enemy vessels. Fortunately (unless you're a stickler for absolute realism), you won't have to wait that long. There is a time compression feature, and I used that feature a lot. As time can be sped up by selectable factors of up to one second equalling four hours, I was able to get to the enemy quicker and make necessary repairs to my sub after battle.

As in real submarine warfare, you are not totally safe even when submerged. Ships on the surface will drop depth charges on you, and the resultant red flashes seem very realistic.

The graphics are good, but they are by no means the best I have seen on the CoCo 3. The outdoor scenes are fair — a dark blue sea against a lighter blue sky, complete with a moon during the nighttime. In the day, the sky is white with a glaring yellow sun. Streaks of white randomly litter the sea to simulate white caps. I mention the graphics only because many of us have come to expect nothing short of the superb for the CoCo 3; but, after all, this is a Simulation, not an artistic program. Its claim to fame is in the sophisticated programming techniques used to create the illusion that you are actually engaged in combat. You *must* keep track of your location and headings through the instrumentation. *Sub Battle* is, without a doubt, the most detailed and realistic Simulation I have seen for the CoCo 3.

The various ships and planes appear in silhouette form as black objects against a blue or white background. A built-in target book lets you examine them in their silhouette forms just as you will encounter them during warfare. One of the target book's interesting features is that it lets you use the left and right arrow keys to view the target at various angles, including head-on. The idea here is that the better you know your enemy, the better your chances are for survival and victory. Because you can choose sides in this Simulation, American as well as foreign ships and planes are displayed. There are battleships, aircraft carriers, destroyers and escorts, as well as merchant ships, patrol boats, tankers and troop transports. Aircraft you will encounter include the Avenger, Catalina PBY, Aichi Seaplane and the infamous Zero.



You navigate your submarine by using the View, Heading and Speed gauges. The screen you see during most of the Simulation is loaded with instruments and gauges that provide you with degrees of view, heading, speed and depth. Other instruments indicate status of electric or diesel operation, battery charge level, scope depth, antiaircraft and deck guns, as well as forward and aft torpedoes. Keeping an eye on the map display will prevent you from running aground as frequently as I did while pursuing the enemy. Also, the well-illustrated 36-page instruction manual contains information on determining longitude and latitude.

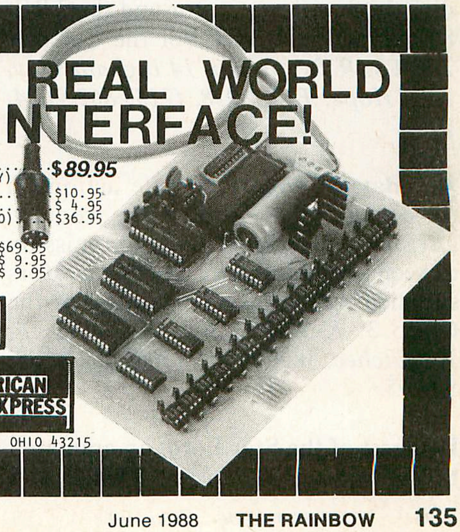
The CoCo 3 keyboard is used extensively during the Simulation. Every number key, 15 of the alphabetic keys, the up and down arrows and two of the function keys are each assigned a function. Suffice it to say that virtually every aspect of submarine warfare and crew operation is covered.

In another gesture to realism, the crew members converse with you through short statements shown on the screen. They warn you of impending danger, such as shallow water, and advise you when it is inappropriate to view from the tower (like when you are under water). They also announce any damage during battle and tell you how long it will take to repair each damaged component.

Sub Battle Simulator is both fun and challenging and is nicely packaged. However, the instruction booklet refers to most popular computers other than the CoCo 3. References to the CoCo 3 are made in the form of two added hardback cards that contain all the keyboard commands, difficulty levels and loading instructions. I got the impression that rather than reprint the colorful manual just to add the words *CoCo 3*, it would be a lot cheaper just to add the cards. I agree with that approach, since it has to help keep unnecessary reprinting costs down, but I am sure that some will take exception to the technique. I hope the savings are passed on to CoCo 3 customers. Besides, it's refreshing to see the CoCo 3 finally included in some of the popular programs written for other computers.

(Epyx, Sunnyvale, CA; $29.95. Available in Radio Shack stores nationwide.)

— David Gerald



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Received and Certified

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, *your assurance that we have seen the product and have ascertained that it is what it purports to be.*

Basic Screen Editor, a 1.5K ML full-screen editor that features full cursor control using the arrow keys and has capability for forward delete, automatic custom PALETTE setting, case conversion, and insert and overwrite modes. For the CoCo 1, 2 and 3. *Howard Medical Company, 1690 N. Elston, Chicago, IL 60622, (312) 278-1440; $25.*

Bowling League Secretary, a bowling manager that has been updated with new features, including the ability to generate final tally sheets. Upgrades include installation and instruction sheets. For the CoCo 1, 2 and 3. *TOMELA*CO, P.O. Box 2162, Doylestown, PA 18901, (215) 348-5822; $9.95 for upgrade.*

Car Sign Designer, a WYSIWYG disk program that lets you design, print and display a car sign, and includes a reusable sign holder. For the CoCo 2 and 3. *Zebra Systems, Inc., 78-06 Jamaica Ave., Woodhaven, NY 11421, (718) 296-2385; $29.95.*

Ⓕ **CCAD**, a BASIC computer-aided design package requiring a 64K CoCo, disk drive, color monitor and the TRS-80 Multi-Pen Plotter. For the CoCo 1, 2 and 3. *R.B. Dunbar, 14 Ingham Way, New Hope, PA 18938, (215) 862-2674; $50.*

Frogday Afternoon, arcade action on the ocean floor — protect the frogmen as they swim to and fro in their mission to keep the underwater city's generators supplied with solarian crystals. For the CoCo 3. *K-SOFT, 300 13th N.E., E. Wenatchee, WA 98802, (509) 662-9365; $24.95.*

In Quest of the Star Lord, an animated mix of science and fantasy in which you quest for the Phoenix Crossbow in a post-holocaust world. Two-disk graphics Adventure for the CoCo 3. *Sundog Systems, 21 Edinburg Drive, Pittsburgh, PA 15235, (412) 372-5674; $34.95 plus $2.50 S/H.*

Ⓕ **Labyrinth**, a 64K ECB Adventure in which you must fight to wrest your kingdom from an evil wizard who has imprisoned you and taken over your throne. For the CoCo 1 and 2. *R.T.B. Software, P.O. Box 777, West Acton, MA 01720, (617) 263-0563; $24.95 plus $3 S/H.*

Ⓕ **Race-Timer**, a program to time Tyco, AFX and H-O slot cars. A segment of track included connects to the joystick ports. Designed for the CoCo 2. *Ken Dittmar, 1905 Brandywine Court, Fayetteville, NC 28304, (919) 424-6777; $39 plus $3 S/H.*

Type-It, a menu-driven BASIC word processor that has options for justified text; it works with the DMP-105, DMP-106 and Epson-compatible printers. For the CoCo 3. *R.J.F. Software, R.R. #2, White Lake, Ontario, Canada K0A 3L0, (613) 623-7824; $19.95 plus $3 S/H.*

Ⓕ **VALENTIN**, a 64K disk program that generates personalized valentines to your computer screen and to the TRS-80 Multi-Pen Plotter. For the CoCo 1, 2 and 3. *R.B Dunbar, 14 Ingham Way, New Hope, PA 18938, (215) 862-2674; $10.*

VIP Writer III, an upgrade of the *VIP Writer* word processor for the CoCo 3. New features include screen widths of up to 80 characters, foreground and background color selection from CoCo 3's PALETTE, fast screen action, and a built-in print spooler with a 49,000-character buffer. *SD Enterprises, P.O. Box 1233, Gresham, OR 97030, 503-663-2865; $79.95.*

Wargame Designer, a military Simulation that has been updated to include a PALETTE function and two more games, including Invasion North, Attack on Moscow, Robot Command and Dungeon Warrior. For the CoCo 3. *SPORTSware, 1251 S. Reynolds Road, Suite 414, Toledo, OH 43615, (419) 389-1515; $29.*

Ⓕ **First product received from this company**

The *Seal of Certification* program is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

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— Lauren Willoughby

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An 80-column adapter project for the CoCo 1 and 2

Increasing Character Display

By Tony DiStefano
Rainbow Contributing Editor

CoCo 1 and 2 users, remember when the CoCo 3 came out? One of the good things built right into the CoCo 3 is an 80-character-by-24-line display screen. I guess you must have felt left out in the cold. If you have a CoCo 1 or 2 with a Multi-Pak and are using OS-9, your luck will change; you too can now have an 80- by 24-character display.

I say this is a big project not because it is hard to build, but because the overall project will take a bit of time and some hardware considerations. For instance, if you want an 80-by-24 display, you must have a monitor capable of displaying 80-by-24 characters. That requires an RS-70 compatible monitor of about 20 MHz resolution. You will also need a Multi-Pak and software. (You know what I think of software — leave it to the programmers.) CRC will send you OS-9 Level I Version 2 software to drive this display for about $10.

In the old days, an 80-by-24 character display required many chips, starting with the display chip. For many years, the most common display chip was the Motorola MC6845, back then a very powerful chip. It had a bunch of registers and counters that would divide a high-frequency clock into two lower frequencies. The higher of the two was the horizontal frequency, usually about 15 KHz; the other was the vertical frequency, at about 60 Hz. Also coming from this display chip was a character address. Part of this address went directly to a character-generator ROM. Now, a character-generator ROM is nothing more than a ROM with bit-mapped graphics of what letters and numbers are made of.

The other part of the character address went to the address lines of one side of some dual-ported RAM, which was ordinary RAM with some extra circuitry allowing two devices to read and write data to the same RAM. Also included in this circuitry was a circuit to switch between the two.

The other side of the dual-ported RAM usually was connected to a CPU, like the MC6809 CPU that is in all CoCos. The data lines of the RAM fed the rest of the address lines of the character ROM, and the ROM's data lines fed into a parallel-to-serial shift register. This shift register is the dot pattern that flows out of the display adapter and onto your screen. This dot pattern is mixed with the vertical and horizontal frequencies, called sync signals, into one signal that is called composite video.

Sound a little complicated? It might be at first, but read it again a couple of times and you'll understand it. Think of it like this: The CPU writes data characters into RAM, one character per byte of memory. The display chip, along with its support circuitry, reads this data and converts it into a stream of dots. With these dots come the signals necessary to control your monitor's circuitry to keep these dots in sync so that, to you, they look like characters such as letters and numbers.

What I have described requires a display chip (such as the MC6845), a character ROM, a RAM chip, about 20 other TTL support chips like the shifter and dual port circuitry. That makes quite a big job to design, let alone to do the board space and the wiring. But in the past, that's the way that technology was used.

Today things are different. Super LSI (Large Scale Integration) chips are here: The CoCo 3 is proof of that. The GIME chip is a video display adapter, a memory map decoder and a memory management adapter all in one. Chips like that contain thousands of TTL equivalents.

To make this 80-column display, I will use an LSI chip made by Standard Microsystems Corporation (SMC), the CRT 9128. This chip by itself does most of the work I described above. It has built-in character ROM, all porting circuitry, and all decoding and shifting chips. The only support chip it requires is RAM. Add that and a couple of decoding chips, and you are done.

As you can see from the diagram in Figure 1, there are not many components in this project. U1 is the SMC chip, U2 is the RAM chip. A 6116 is a 2K-by-8-bit RAM chip. U3 is used for decoding, and U4 is used for the video output and mixing to form composite video. In the diagram all the pins of U1 are numbered and have abbreviated names. Most of the names are self-explanatory; the ones that are not are listed below:

Pin No.	Name	Function
7	VID	serial video data
18	HS	horizontal sync
19	VS	vertical sync
20	CS	composite sync, (HS and VS combined)
8	INT	intensity pin

Before I get into the project's construction, a little information on the SMC chip in needed. The SMC chip has internal registers that control the many aspects required to display characters on the screen. In order to talk to this chip, we must know where it is in the memory map below:

Location	Direction	Function
$FF54	Write	Writes to data register
$F554	Read	Reads from data register
$FF55	Write	Writes to address register
$FF55	Read	Reads status register

The CPU communicates with the video chip via seven registers. Access to these registers is made by first storing the register number in the address

---

Tony DiStefano is a well-known early specialist in computer hardware projects. He lives in Laval Ouest, Quebec. Tony's username on Delphi is DISTO.

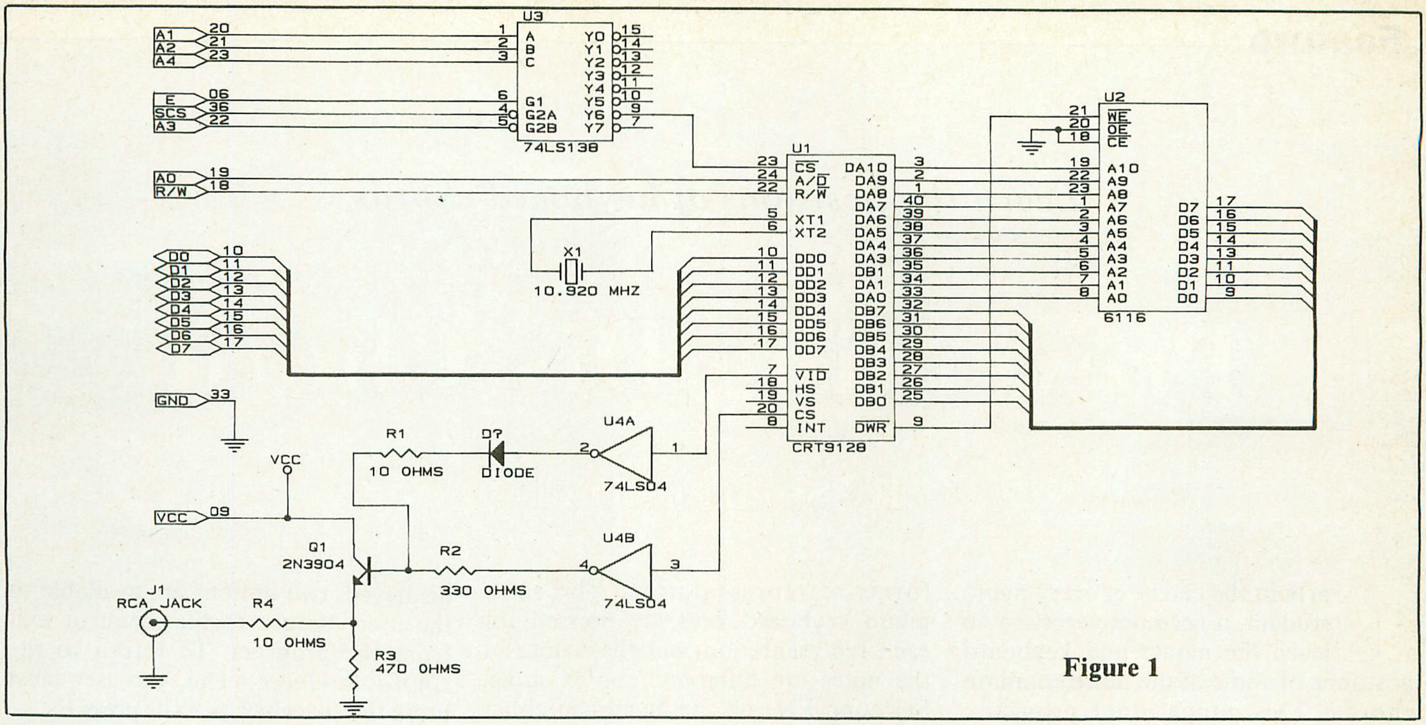

U3
A
B
C
G1
G2A
G2B
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
74LS138
A1
A2
A4
E
SCS
A3
A0
R/W
D0
D1
D2
D3
D4
D5
D6
D7
GND
VCC
U1
CS
A/D
R/W
XT1
XT2
DD0
DD1
DD2
DD3
DD4
DD5
DD6
DD7
VID
HS
VS
CS
INT
DA10
DA9
DA8
DA7
DA6
DA5
DA4
DA3
DB1
DA1
DA0
DB7
DB6
DB5
DB4
DB3
DB2
DB1
DB0
DWR
CRT9128
X1
10.920 MHZ
U2
WE
OE
CE
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
D7
D6
D5
D4
D3
D2
D1
D0
6116
R1
10 OHMS
D?
DIODE
U4A
74LS04
U4B
74LS04
R2
330 OHMS
VCC
Q1
2N3904
J1
RCA JACK
R4
10 OHMS
R3
470 OHMS

Figure 1

register and then accessing the register's data through the data register. The following is a list of the addresses and functions of available registers.

Address	Register Function
$6	Chip Reset
$8	TOS Add
$9	CUR Lo
$A	CUR Hi
$B	Fil Add
$C	ATT Dat
$D	Character
$E	Mode Register

For example, if you want to address the CUR Lo register, store the value $9 at $FF55 then store the CUR Lo byte at $FF54. Each of the seven registers has a specific function:

Chip Reset — The first thing done after powering up the chip. Stores $6 in $FF55 then stores a 0 value in the data register.

TOS Add — TOS stands for Top Of Screen. Top of screen address bits are DA10 to DA4, for D6 to D0, respectively. DA3 to DA0 are internally set to 0, forcing the first address at the beginning of each row to be 00, 16, 32 and so forth.

CUR L0 — Cursor low address position of flashing cursor. This is the first eight bits of the cursor address.

CUR Hi — Cursor high address position of flashing cursor. Bits D2 to D0 are DA10 to DA8, respectively. Other bits set to 0.

Fil Add — Fills address locations starting from cursor position to the fill address. Bits D6 to D0 are addresses from DA10 to DA4, respectively. As with TOS, the least three bits are always 0.

ATT Dat — Attribute Data, a register that changes the way things appear on the screen. The attribute byte:

D7 = 1 Enables block graphics
= 0 Enables Alpha Mode
D6 = 1 Disables cursor (Invisible)
= 0 Enables cursor (Visible)
D5 = 1 Underlines cursor
= 0 Blocks cursor
D4 = 1 White screen and black characters
= 0 Black screen and white characters
D3 = 1 Enables video suppress
= 0 Allows character blinking
D2 = 1 Hi intensity
= 0 Lo intensity
D1 = 1 Character underlined
= 0 Character not underlined
D0 = 1 Character in inverse video
= 0 Character in normal video

Character — Register where the ASCII character is placed to appear on the screen. If Bit D7 is set, the attributes described in the above byte (bits D3 to D0) will take effect on that character.

Mode — Auto increment mode. If Bit D7 is set to 1, the cursor address will automatically increment by one every time a byte is written to the character byte. If D7 is set to 0, the auto increment is disabled.

The basics for this display chip ought to be enough to get you started. If you want more detail, contact SMC at 35 Marcus Blvd., Hauppauge, NY 11788. For this project you will need all the parts shown in Figure 1 and sockets for all the chips. The following is a list of socket sizes and the pin numbers for +5V and ground:

Chip No.	Socket Size	+5V	GND
U1	40	21	4
U2	24	24	12
U3	16	16	8
U4	14	14	7

You can get the SMC chip, project board, OS-9 software driver and RAM chip from CRC. Call (514) 383-5293 for prices.

There is one more interesting thing about the project. If you happen to have a Disto Super Controller or Disto Super Controller II, you can wire this project to the MEB connector. Two changes to the diagram in Figure 1 are necessary: Instead of A4, connect Pin 3 of U3 to VCC. Then, instead of A3, connect Pin 5 of U3 to GND. The rest of the connections appear on the bus. Instead of a project board, you can use just about any double-sided PC board. You will need, however, a 17-pin single inline female header. This way, you will not need a Multi-Pak.

Regarding the Multi-Pak, remember that when using the addresses from $FF40 to $FF5F, you must do a slot swap to whatever slot your hardware is, and swap back after you are finished. If you are in a multitasking environment remember to turn off the interrupts before swapping slots, and turn them back on again afterward.

Learn the positions of keyboard chords

Preventing Dis-Chord

By Stuart C. Dods

Early in the career of every piano student, it becomes necessary to learn the names and keyboard positions of some of the more common chords. This educational program, *Chord Producer*, can assist in the learning of these chords.

Chord Producer displays the keyboard position, the musical note position on the G clef staff, and the names of the notes of six different chords. The chords are displayed in root position and are available for every musical key. *Chord Producer* also plays a tone that corresponds to each note of the chord.

Using the Program

When the program is executed, the first screen to appear is the *Chord Producer* menu. This text screen first asks the user to select the particular musical note that will determine the root position of the chord. The user makes this selection by entering the number that corresponds to the musical key. There are 12 musical keys.

Some musical keys have two distinct forms of representation. The same piano keyboard keys are pressed for each representation, but the names of the notes are different. For example, Selection Five on the menu can either be represented as the key of C-Sharp or of D-Flat. When one of these musical keys is selected, the menu then asks the user to choose between the sharp or flat representation by pressing either S or F.

Sharp keys are indicated in the menu by the number sign (#), and the flat keys are denoted by the negative sign (-). Musical key selections 2, 5, 7, 10 and 12 require the user to specify either the sharp or flat representation.

The next decision is to indicate the type of chord. The chord selection includes major, minor, augmented and diminished chord types. The user enters the number corresponding to one of the six chord types listed.

A graphics screen then appears. This screen displays a musical staff (G clef) and a portion of a keyboard that includes middle C. Each note of the selected chord is displayed on the staff as well as signified on the keyboard while the appropriate tone is sounded. The notes of the chord are displayed one at a time. The letter name for each note is provided at both the piano keyboard and the staff positions.

Once the selected chord has been displayed, two options are available to the user: Return to the menu or exit from the program. To return to the *Chord Producer* menu, the user must press the spacebar; to exit, press E.

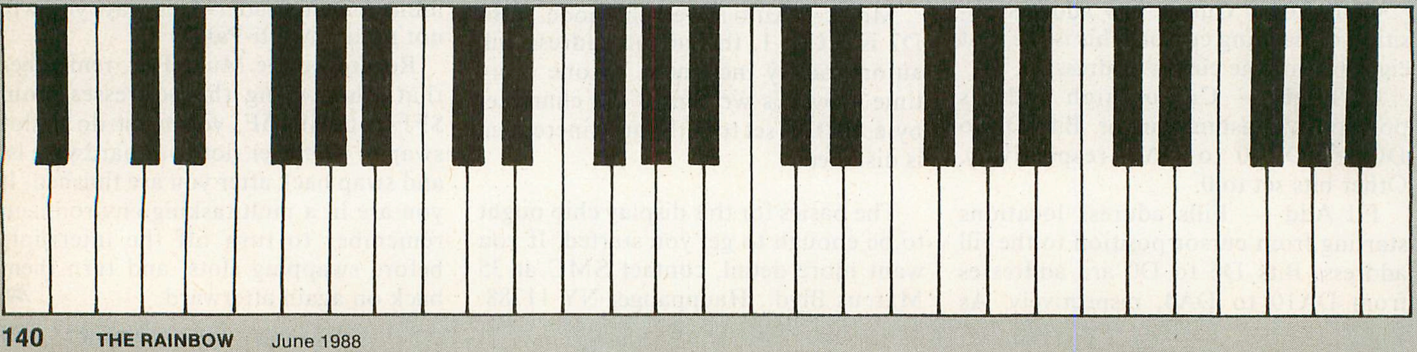
Program Description

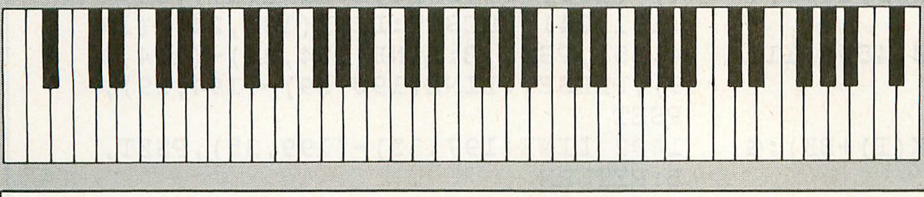
The following is a list of variables and their descriptions:

`KP( )` = Keyboard horizontal positions
`S( )` = Musical tones
`SP( )` = Staff vertical positions
`SY` = Specific staff vertical coordinate
`BK$` = Sharp or flat key
`K` = Key selection
`SK( )` = Used to determine sharp or flat sign display
`X1,Y1` = Letter name horizontal and vertical positions
`N` = Number of notes in a selected chord.

Lines 10 through 25 establish the menu routine, and lines 100 through 160 set up a graphics screen. Lines 1100 through 1600 install chord formats and display chord names. Lines 2100 through 3100 establish key formats and display letter names, and lines 4000 through 4700 set up note name formats.

Stuart Dods, a teacher of computer science on the high school and university level, is also a professional musician and composer. He is the author of A Collection of Points: Mathematics Problem Solving With A Computer.





(Questions or comments about this program may be directed to the author at 231 Thelma Avenue, Merrick, NY 11566. Please enclose an SASE when requesting a reply.) ☐

25	45	2000	224
330	193	2420	132
422	45	4300	197
1102	48	END	247
1401	161		

The listing: CHORDS

```
1 DATA 8,16,26,46,54,64,74,84,10
3,112,123,132,141,151,161,179,18
9,198,209,217,237,243,58,69,78,8
9,99,108,117,125,133,140,147,153
,159,165,170,176,180,185,189,193
,197,200,63,63,59,55,55,51,51,47
,43,43,39,39,35
2 REM ***** CHORD PRODUCER ****
3 REM ***** BY STUART DODS ****
5 DIM K(13),N(4),SF(4),KP(22),S(
22),SP(13)
7 FOR I=1 TO 22:READ KP(I):NEXTI
:FOR I=1 TO 22:READ S(I):NEXTI:F
OR I=1 TO 13:READ SP(I):NEXTI
10 SK=0:BK$="N":BK=0:CLS:PRINT@9
,"CHORD PRODUCER"
12 PRINT@129,"1 2  3 4 5  6 7  8
 9 10  11 12":PRINT@161,"A A# B
C C# D D# E F F#  G  G#"
13 PRINT@193," B-      D-    E-
   G-      A-"
15 PRINT@66,"WHAT KEY (ENTER NUM
BER) ";:INPUT K:IF K<1 OR K>12 T
HEN SOUND 89,1:PRINT@92,"    ":GO
TO15
17 IF K=2 OR K=5 OR K=7 OR K=10
OR K=12 THEN PRINT@258,"(s)HARP
OR (f)LAT ";:INPUT BK$
20 PRINT@320,"(1) MAJOR":PRINT@3
52,"(2) MINOR":PRINT@384,"(3) SE
VEN":PRINT@416,"(4) AUG.":PRINT@
448,"(5) DIM.7":PRINT@480,"(6) M
INOR 7";
25 PRINT@332,"WHICH CHORD TYPE";
:INPUT C:IF C<1 OR C>6 THEN SOUN
D 89,1:GOTO 25
90 PMODE 3,1:PCLS:SCREEN 1,1
100 FOR Y=15 TO 49 STEP 8:LINE(4
,Y)-(60,Y),PSET:NEXT Y:FOR X=1 T
O 3:LINE(X,14)-(X,48),PSET:NEXTX
110 IF K=1 OR (K=2 AND BK$="S")
THEN 120
115 IF K=3 OR K=4 OR (K=2 AND BK
$="F") OR (K=5 AND BK$="S") THEN
 125 ELSE 150
120 LINE(40,63)-(60,63),PSET
125 LINE(40,55)-(60,55),PSET
150 LINE(10,50)-(14,55),PSET:LIN
E(14,55)-(14,4),PSET:CIRCLE(7,16
),17,0,1.2,.89,.15:CIRCLE(15,39)
,9
300 FOR X=0 TO 249 STEP 19:LINE(
X,90)-(X+15,130),PSET,B:NEXT X
320 LINE(0,90)-(5,112),PSET,BF:L
INE(10,90)-(24,112),PSET,BF:LINE
(237,90)-(250,112),PSET,BF
330 FOR X=48 TO 71 STEP 19:LINE(
X,90)-(X+14,112),PSET,BF:LINE(X+
133,90)-(X+147,112),PSET,BF:NEXT
 X
340 FOR X=107 TO 150 STEP 19:LIN
E(X,90)-(X+14,112),PSET,BF:NEXT
X
390 SK=K:IF BK$="F" THEN SK=K+1:
BK=1
394 IF SK=13 THEN GOSUB 2000:GOT
O 397
395 ON SK GOSUB 2000,2000,2100,2
200,2200,2300,2300,2400,2410,241
0,2190,2190
397 IF BK$="F" THEN GOSUB 3000:G
OTO400
398 IF BK$="S" THEN GOSUB 3100
400 ON C GOSUB 1100,1200,1300,14
00,1500,1200
410 K(1)=K:FOR I=1 TO N:KY=120:X
1=KP(K(I))-4:Y1=142:CC=3:IF K(I)
=2 OR K(I)=5 OR K(I)=7 THEN KY=1
03:CC=1:Y1=85:GOTO 416
412 IF K(I)=10 OR K(I)=12 OR K(I
)=14 THEN KY=103:Y1=85:CC=1:GOTO
416
414 IF K(I)=17 OR K(I)=19 OR K(I
)=22 THEN KY=103:Y1=85:CC=1
416 IF BK$="F" THEN SF(I)=SF(I)-
```

```
1
418 IF BK$="S" THEN SF(I)=SF(I)+
1
420 CIRCLE(KP(K(I)),KY),6,CC:ON
N(I) GOSUB 4000,4100,4200,4400,4
290,4300,4190
422 ON SF(I) GOSUB 4490,4500,110
5,4600,4700
425 SOUNDS(K(I)),6
430 IF I=1 THEN SY=SP(K(I)+BK):G
OTO 440
435 SY=SY-8
440 CIRCLE(51,SY),6,2,.6:X1=66:Y
1=SY+4:ON N(I) GOSUB 4000,4100,4
200,4400,4290,4300,4190
442 ON SF(I) GOSUB 4490,4500,110
5,4600,4700
450 NEXT I
500 A$=INKEY$:IF A$=CHR$(32) THE
N 10
510 IF A$="E" THEN 600 ELSE 500
600 CLS:END
1099 REM  ***  MAJOR CHORD **
1100 N=3:K(2)=K+4:K(3)=K+7
1101 LINE(154,35)-(154,21),PSET:
LINE(155,21)-(159,24),PSET:LINE(
159,26)-(164,21),PSET:LINE(164,2
1)-(164,35),PSET:LINE(166,35)-(1
70,26),PSET:LINE(170,26)-(174,35
),PSET:LINE(168,27)-(172,29),PSE
T
1102 LINE(176,33)-(176,35),PSET:
LINE(176,35)-(180,35),PSET:LINE(
180,35)-(180,26),PSET:LINE(176,2
6)-(184,26),PSET:LINE(187,26)-(1
93,35),PSET,B:LINE(196,35)-(196,
26),PSET:LINE(196,26)-(203,29),P
SET,B:LINE(200,29)-(204,35),PSET
1105 RETURN
1199 REM  ***  MINOR CHORD **
1200 N=3:K(2)=K+3:K(3)=K+7:SF(2)
=SF(2)-1
1201 LINE(154,35)-(154,21),PSET:
LINE(154,21)-(159,24),PSET:LINE(
159,24)-(164,21),PSET:LINE(164,2
1)-(164,35),PSET:LINE(170,26)-(1
70,35),PSET:LINE(176,35)-(176,26
),PSET:LINE(176,26)-(184,35),PSE
T:LINE(184,35)-(184,26),PSET
1202 LINE(188,26)-(194,35),PSET,
B:LINE(198,35)-(198,26),PSET:LIN
E(198,26)-(205,29),PSET,B:LINE(2
02,29)-(206,35),PSET
1204 IF C=6 THEN N=4:M=60:K(4)=K
+10:GOSUB 1600
1205 RETURN
1299 REM  ***  SEVEN CHORD **
1300 N=4:M=0:K(2)=K+4:K(3)=K+7:K
(4)=K+10:GOSUB 1600:RETURN
1399 REM  ***  AUG. CHORD **
1400 N=3:K(2)=K+4:K(3)=K+8:SF(3)
=SF(3)+1
1401 LINE(154,35)-(162,20),PSET:
LINE(162,20)-(169,35),PSET:LINE(
158,28)-(164,28),PSET:LINE(175,2
4)-(183,35),PSET,B:LINE(177,24)-
(181,24),PRESET:LINE(186,24)-(19
4,35),PSET,B:LINE(194,24)-(194,2
9),PRESET:LINE(190,29)-(194,29),
PSET
1402 LINE(197,33)-(199,35),PSET,
B:RETURN
1499 REM  ***  DIM. CHORD **
1500 N=4:K(2)=K+3:K(3)=K+6:K(4)=
K+9:SF(2)=SF(2)-1:SF(3)=SF(3)-1:
SF(4)=SF(4)-1
1505 LINE(154,35)-(154,21),PSET:
CIRCLE(154,28),15,0,.7,.77,.24:L
INE(172,26)-(172,35),PSET:LINE(1
77,35)-(177,26),PSET:LINE(177,26
)-(182,30),PSET:LINE(182,30)-(18
7,26),PSET:LINE(187,26)-(187,35)
,PSET:M=40:GOSUB 1600:RETURN
1600 LINE(154+M,23)-(154+M,21),P
SET:LINE(154+M,21)-(164+M,21),PS
ET:LINE(164+M,21)-(161+M,35),PSE
T:RETURN
1999 REM  ***  BIG A **
2000 LINE(105,35)-(120,21),PSET:
LINE(120,21)-(135,35),PSET:LINE(
112,28)-(128,28),PSET:N(1)=1:N(2
)=3:N(3)=5:N(4)=7:SF(1)=3:SF(2)=
4:SF(3)=3:SF(4)=3:RETURN
2099 REM  ***  BIG B **
2100 LINE(105,21)-(130,28),PSET,
B:LINE(105,28)-(135,35),PSET,B:N
(1)=2:N(2)=4:N(3)=6:N(4)=1:SF(1)
=3:SF(2)=4:SF(3)=4:SF(4)=3:RETUR
N
2189 REM  ***  BIG G **
2190 LINE(125,33)-(125,30),PSET:
LINE(125,31)-(136,31),PSET:N(1)=
7:N(2)=2:N(3)=4:N(4)=6:SF(4)=3
2199 REM  ***  BIG C **
2200 CIRCLE(125,28),15,0,.7,.09,
.89:IF SK=4 OR SK=5 THEN N(1)=3:
N(2)=5:N(3)=7:N(4)=2:SF(4)=2
2205 SF(1)=3:SF(2)=3:SF(3)=3:RET
URN
2299 REM  ***  BIG D **
2300 LINE(107,35)-(107,21),PSET:
CIRCLE(106,28),23,0,.38,.77,.24:
N(1)=4:N(2)=6:N(3)=1:N(4)=3:SF(1
)=3:SF(2)=4:SF(3)=3:SF(4)=3:RETU
RN
2399 REM  ***  BIG E **
2400 LINE(133,35)-(107,35),PSET:
N(1)=5:N(2)=7:N(3)=2:N(4)=4:SF(1
)=3:SF(2)=4:SF(3)=3:SF(4)=3
2409 REM  ***  BIG F **
2410 LINE(107,35)-(107,21),PSET:
LINE(107,21)-(133,21),PSET:LINE(
107,27)-(128,27),PSET:IF SK=9 OR
 SK=10 THEN N(1)=6:N(2)=1:N(3)=3
:N(4)=5:SF(1)=3:SF(2)=3:SF(3)=3:
SF(4)=2
2420 RETURN
2999 REM  ***  BIG FLAT **
3000 LINE(140,32)-(140,18),PSET:
LINE(140,26)-(146,32),PSET,B:RET
URN
3099 REM  ***  BIG SHARP **
3100 LINE(140,27)-(152,27),PSET:
LINE(140,22)-(152,22),PSET:LINE(
143,18)-(143,32),PSET:LINE(149,1
8)-(149,32),PSET:RETURN
3999 REM ***  A  ***
4000 LINE(X1,Y1)-(X1+4,Y1-6),PSE
T:LINE(X1+4,Y1-6)-(X1+9,Y1),PSET
:LINE(X1+3,Y1-3)-(X1+6,Y1-3),PSE
T:RETURN
4099 REM ***   B  ***
4100 LINE(X1,Y1-6)-(X1+6,Y1-3),P
SET,B:LINE(X1,Y1-3)-(X1+8,Y1),PS
ET,B:RETURN
4190 LINE(X1+4,Y1-2)-(X1+7,Y1-2)
,PSET
4199 REM ***  C  ***
4200 LINE(X1,Y1-6)-(X1+7,Y1),PSE
T,B:LINE(X1+7,Y1-5)-(X1+7,Y1-2),
PRESET:RETURN
4289 REM ***   E  ***
4290 LINE(X1,Y1)-(X1+7,Y1),PSET
4300 LINE(X1,Y1)-(X1,Y1-6),PSET:
LINE(X1,Y1-6)-(X1+7,Y1-6),PSET:L
INE(X1,Y1-3)-(X1+5,Y1-3),PSET:RE
TURN
4399 REM ***   D  ***
4400 LINE(X1,Y1)-(X1,Y1-6),PSET:
CIRCLE(X1,Y1-3),9,0,.5,.77,.24:R
ETURN
4490 LINE(X1+16,Y1-4)-(X1+16,Y1-
6),PSET:LINE(X1+16,Y1-3)-(X1+20,
Y1),PSET,B
4500 LINE(X1+11,Y1-4)-(X1+11,Y1-
6),PSET:LINE(X1+11,Y1-3)-(X1+14,
Y1),PSET,B
4510 RETURN
4599 REM ***  SHARP  ***
4600 LINE(X1+11,Y1-2)-(X1+17,Y1-
2),PSET:LINE(X1+11,Y1-4)-(X1+17,
Y1-4),PSET:LINE(X1+13,Y1)-(X1+13
,Y1-6),PSET:LINE(X1+15,Y1)-(X1+1
5,Y1-6),PSET:RETURN
4699 REM  ***  DOUBLE SHARP **
4700 LINE(X1+11,Y1-2)-(X1+13,Y1)
,PSET,B:LINE(X1+17,Y1-2)-(X1+19,
Y1),PSET,B:LINE(X1+11,Y1-6)-(X1+
13,Y1-4),PSET,B:LINE(X1+17,Y1-6)
-(X1+19,Y1-4),PSET,B:RETURN
```

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How to translate some BASIC keywords into assembly language

Assembly Language: Getting Back to BASICs

By David J. Gabler

Have you ever wondered what lies beneath BASIC? In the Color Computer, BASIC is an interpretive language that sorts through your files line by line, looking for errors. If there are no errors, it then executes the commands in machine language.

This makes BASIC a comparatively slow language to work with. For the most part, the speed of machine language is not all that critical; but certain applications like sorts, graphics animation and data communications often require greater speed than BASIC will allow.

The hardest part of learning assembly language (the text files that are then translated into the binary 1's and 0's of machine language), is learning to recognize how BASIC functions are created. This is a real stumbling block for some people. For the most part, things that can be accomplished in BASIC with one or two commands will require a few more commands in assembly. This is because, with assembly language, you have more direct control over each function. You can manipulate the bits yourself.

For as long as you have been programming, you have put information on the screen by using the `PRINT` statement. In assembly language, you have to do all the internal manipulations of each character yourself. This causes some people to run away in fear, but it does not have to be an excruciating experience. Let's take it one step at a time.

In assembly language, certain registers are used to hold data temporarily. If you want to hold the data more permanently, you must poke it into memory. This is because there are so few registers, and they are constantly needed to pass and compare data.

It is a good idea to have several subroutines that act as BASIC keywords imbedded in your programs. Then, when a specific function is needed, it is simple to load the registers and `GOSUB` to that subroutine. It makes the program much easier to code and debug and to read later, especially if remarks are used (heavy commenting never hurt the readability of an assembly listing).

What follows is a short dictionary of 29 BASIC commands and how they are accomplished in assembly. Since assembly is much more unregimented than BASIC, there are several ways to go about a task. There are also some BASIC keywords that are no longer needed in assembly.

CLEAR

In BASIC this command saves string space. In assembly, we might think of it as an initialization statement that clears an area of memory for variables. Unlike BASIC, however, the memory area set aside is not protected. It is up to you to set it aside, clear it, and then make sure you do not write over it with something else. It is up to you to keep track of it.

The memory area can be cleared with a simple loop:

```
START     LDX #$7F00     LOAD X WITH START ADDRESS
NOTEND    CLR ,X+        CLEAR MEMORY AND INCREMENT X
          CMPX #$7FFF    COMPARE X TO END ADDRESS
          BNE NOTEND     IF NOT DONE, GO BACK AGAIN
        ' MEMORY IS CLEAR AND THE PROGRAM PROCEEDS
```

CLEAR 200,&H7F00

In BASIC this is used to protect an area of memory from BASIC, so that it can be used for ML programs or data. In assembly, it is up to you to make sure that you do not interfere with memory reserved for other uses. It is a good idea to draw up a rough memory map that defines those areas of memory used by your program, those used by the system and those that are not used. In this way, it will be easier to keep track of memory.

CLS

In BASIC this clears the screen. In assembly it is simply a matter of clearing all the memory locations that are used by

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the screen display. In the CoCo, these addresses reside in memory from 1024 to 1535. A short loop will accomplish this:

```
START     LDA #96         LOAD A WITH A BLANK CHARACTER
          LDX #1024       LOAD X WITH SCREEN LOCATION
NOTEND    STA ,X+         STORE A AT SCREEN AND INC X
          CMPX #1535      COMPARE X WITH SCREEN END
          BNE NOTEND      IF NOT AT END, GO BACK AGAIN
      ' SCREEN CLEAR AND PROGRAM PROCEEDS
```

This loop will continue from 1024 to 1535, at which time program execution will continue; whatever instruction comes after the last line will be executed. If this is a subroutine, that instruction is `RTS`.

DATA

In BASIC `DATA` tells the BASIC interpreter that what follows is information, not to be confused as part of the program. BASIC will then ignore the data until a `READ` instruction is given. In assembly you must be sure to pass over the data yourself, or the microprocessor will continue to interpret the data as opcodes, or instructions. For this reason, it is best to keep data tables at the beginning or ending of your program. To define tables, you can use the following instructions:

```
     FCC 'THIS IS A TABLER OF LETTERS'
     FCB 0          A DELIMETER FOR THE TABLE
     FDB $FF27      A TABLE OF TWO NUMBERS
```

DIM

In assembly the programmer keeps track of all variables. A particular chunk of memory is set aside for storing information. Where and how much memory are up to you. It is not difficult to manage this memory, but it is your responsibility.

END

There are several ways to gracefully exit a machine language program. One way is to do a cold start on the machine. On the CoCo, this is accomplished with:

```
START     CLR $71         CLEAR MEMORY LOCATION $71
          JMP $A027       GOTO $A027 AND EXECUTE
```

If the program was called from BASIC, an `RTS` or `RETURN` instruction will return control to the BASIC interpreter; more popularly, the program might not have an end. This is the case if you want your code protected in some way. Once it is executed, it will be difficult to stop without destroying memory contents.

FOR-NEXT-STEP

In BASIC this sets up a loop. We have already seen several loops in our first examples. In BASIC a convenient counter is established for you, but in assembly you must set up a counter and check it yourself:

```
START     LDX #$1650      COUNT FROM $1650
NOTYET    LEAX -1,X       DECREASE COUNTER BY 1
          BNE NOTYET      IF X <> 0 THEN GO BACK AGAIN
      ' COUNTER = 0 AND PROGRAM CAN PROCEED
```

In the case of `FOR-NEXT-STEP`, we simply decrement `X` by the value we want to step by; for example, `LEAX -3,X` would cause the counter to step by -3 every time the loop is executed.

GOSUB

In assembly this is accomplished by a `JSR` or `BSR`. Which command you use depends on whether you are writing address-dependent code. In either case, the program execution branches to the subroutine; and the return address is put on the stack, so that a return can be accomplished using the `RTS` command.

GOTO

In assembly, you use `JMP` or `BRA`. This is an unconditional jump. Unlike `JSR`, it is used to jump over data, or to unconditionally `GOTO` another part of the program. Of course, one may ask why you wrote a part of the program that you must always jump over. Sometimes the need arises, but it is best to avoid this situation.

IF-THEN-ELSE

In assembly this is accomplished using conditional operators. Conditional means that a certain condition must exist for the program to branch:

```
IF        LDA $1002       WHAT IS IN MEMORY AT $1002
          CMPA #$46       IS IT A $46?
          BNE ELSE        NO, SO GOTO ELSE
THEN      LDA #$102       YES, THEN PUT $102 IN A
          STA $1002       POKE $1002,$102
          BRA CONT        JUMP OVER ELSE PART OF PROGRAM
ELSE      LDA #$FF        ELSE PUT 255 IN A
          STA $1002       POKE $1002,$FF
CONT 'REST OF PROGRAM CONTINUES HERE
```

INKEY$

In assembly this is accomplished simply by setting up a small loop to check the keyboard. If the value in A is 0, no key was found, and we can either stay in the loop until a key is found, or continue program execution and come back later to check again:

```
ENTRY     EQU $A000       ROM ROUTINE TO POLL KEYBOARD
START     JSR [ENTRY]     GOTO ROM KEY INPUT ROUTINE
          CMPA #0         WAS A KEY PRESSED?
          BEQ START       NO, GO BACK AND CHECK AGAIN
     'KEY IS IN REGISTER A, PROGRAM PROCEEDS
```

INPUT

For `INPUT` we set up an area of memory, called a buffer, to hold the string. In our example the computer continues to get input from the keyboard, and puts it in the buffer until a `CHR$(13) (RETURN)` is encountered. You can set up the loop to accept only certain keys, or a certain *number* of keys. That is the beauty of assembly — the cards are in your hands, and you can set up the input routine to your liking.

```
ENTRY     EQU $A000       POINT TO INKEY$ ROUTINE
BUFFER    EQU $400        SCREEN IS THE BUFFER
START     LDX #BUFFER     REGISTER X POINTS TO THE BUFFER
LOOP      JSR [ENTRY]     GOTO ROM KEY INPUT ROUTINE
          CMPA #0         WAS A KEY PRESSED?
          BEQ LOOP        NO, GO BACK AND CHECK AGAIN
          CMPA #13        YES, WAS IT A RETURN KEY?
          BEQ DONE        YES, WE ARE ALL DONE
          STA ,X+         NO, SO PUT IT IN THE BUFFER
          BRA LOOP        GO AND GET ANOTHER KEY
DONE 'STRING IS IN THE BUFFER, PROGRAM PROCEEDS
```

LET

This is a dead keyword, but we will discuss its use. It is used to assign a value to a variable, as in `LET Z = 10`. In assembly we must put aside an area of memory to hold our variable and then store the value there:

```
START     LDX #$7FE0          POINT X TO VARIABLE Z
          LDA #$7F            LOAD REGISTER A WITH $7F
          STA ,X              LET Z = $7F
         'PROGRAM EXECUTION CONTINUES HERE
```

ON-GOSUB:ON-GOTO

In BASIC the computer tests several values and then branches to another part of the program, depending on the values found. `ON GOSUB` branches to a subroutine and then returns, whereas `ON GOTO` branches without necessarily returning. Our examples show the use of these commands in assembly language:

```
ON GOSUB

START     LDA $150            GET A VALUE TO TEST
          CMPA #80            IS IT 80?
          BNE NOTIT1          NO, TRY ANOTHER TEST
          BSR CASE1           YES, GOSUB CASE1
          BRA NOTIT2          JUMP PAST SECOND TEST
NOTIT1    CMPA #100           IS IT 100?
          BNE NOTIT2          NO, FITS NEITHER CASE
          BSR CASE2           YES, GOSUB CASE2
NOTIT2    'PROGRAM EXECUTION RESUMES HERE
```

In this case the subroutines, `CASE1` and `CASE2`, must be used carefully, so that the value of Register A will not be changed. This can be accomplished by simply clearing A before returning from the subroutine.

```
ON GOTO

START     LDA $150            PUT A VALUE TO TEST IN A
          CMPA #80            IS IT 80?
          BNE NOTIT1          NO, GOTO NEXT TEST
          JMP CASE1           YES, GOTO CASE1
NOTIT1    CMPA #100           IS IT 100?
          BNE NOTIT2          NO, FITS NEITHER CASE
          JMP CASE2           YES, GOTO CASE2
NOTIT2    'PROGRAM CONTINUES HERE
```

Please note that, although the program execution resumes at `NOTIT2`, the two subroutines called do not necessarily return to that point in the program.

PEEK:POKE

These two commands are very easy to emulate in assembly. To read a value from memory:

```
LDA $1002
```

To write a value into memory:

```
LDA #$32
STA $1002
```

PRINT

Printing on the screen is essentially a matter of poking a screen memory location with the value of a character. To put a character A on the upper left hand portion of the screen, for instance:

```
START     LDA #65             LOAD A WITH A 65 (LETTER A)
          STA $400            PRINT IT TO THE SCREEN
```

PRINT@

To print a string to a certain place on the screen, put it in a table, and output it to the screen one character at a time. This is how BASIC does it. The string should have a zero, known as a delimiter, at the end, so that the program can find the end of the message:

```
$7FE0 - H
$7FE1 - I
$7FE2 - 0

START     CLRA                CLEAR THE A REGISTER
          LDX #$7FE0          SET X TO POINT AT THE MESSAGE
          LDY #$400           SET Y TO POINT AT THE SCREEN
 LOOP     LDB A,X             GET CHARACTER TO PRINT FROM TABLE
          BEQ NOMORE          IF B=0, NO MORE TO PRINT
          STB A,Y             PRINT TO SCREEN
          INCA                INCREMENT COUNTER
          BRA LOOP            GO BACK FOR NEXT CHARACTER
NOMORE    'PROGRAM CONTINUES HERE
```

PRINT#-2

To print to the printer, set the baud rate value to the appropriate amount by poking it in Location 150, and then send each character to the ROM print routine after setting the device number. The device number simply tells the computer which device to print to. In this case, it will be #-2, the printer:

```
START     LDA #-2             SET REGISTER A TO PRINTER
          STA $6F             STORE A TO DEVICE NUMBER
          LDA #18             SET A TO 2400 BAUD
          STA $96            STORE A IN BASIC BAUD COUNTER
          LDA #65             PUT CHARACTER A IN REGISTER A
          JSR [$A002]         GOSUB ROM PRINT ROUTINE
      'PROGRAM EXECUTION CONTINUES HERE
```

REM

Comments can be scattered throughout the source code and should be used abundantly. It is very easy to forget what a particular segment of the program does, but with ample comments this should not happen often.

One-Liner Contest Winner . . .

If you need address labels fast, this one-liner should fill the bill. Just follow the prompts and type in the name and address and how many labels you want printed.

The listing:

```
1 CLS:A=0:INPUT"INPUT # OF LABEL
S, NAME, ADDRESS, CITY STATE ZIP
";A,B$,C$,D$:PRINT@224,"LABELS T
O BE PRINTED "A:FORE=1TOA:PRINT#
-2,B$:PRINT#-2,C$:PRINT#-2,D$:FO
RF=1TO3:PRINT#-2:NEXT:SOUND200,1
:G=G+1:PRINT@256,"LABELS PRINTED
";G:NEXT:GOTO1
```

James R. Demers
Chicopee, MA

(For this winning one-liner contest entry, the author has been sent copies of both *The Second Rainbow Book of Simulations* and its companion *The Second Rainbow Simulations Tape*.)

RETURN

RTS works the same way that RETURN does in BASIC. After a BSR or JSR instruction is given, the return address is placed on the stack. When the microprocessor encounters an RTS instruction, the return address is pulled off the stack and put into the program counter, effectively bringing program execution back to just after the place where the JSR was encountered.

ASC:CHR$

In BASIC these are used to "translate" between the actual character and its ASCII equivalent. There is no need for this in assembly. If you are working with #65, you only need to output it to the string to turn it into an A. In assembly 65 = A; there is no such statement as CHR$(65). Any value is dealt with directly. You, as programmer, are responsible for knowing what type of value you are dealing with.

LEN

In order to perform functions on strings such as LEFT$, RIGHT$ and MID$, it is necessary to first know the length of the string. Since your strings will be stored with a zero delimiter, it will be relatively easy to find their length.

```
START     CLRB           ZERO THE COUNTER OF THE STRING
          LDX #$7FE0     POINT TO THE STRING WITH X
LOOP      LDA ,X+        GET A CHARACTER FROM THE STRING
          BEQ FOUND      IF A=0 THEN WE HAVE THE LENGTH
          INCB           INCREMENT THE COUNTER
          BRA LOOP       GO BACK FOR MORE DATA
FOUND     'THE LENGTH IS NOW IN THE B REGISTER
```

RIGHT$

After having returned from the length subroutine, you may want to find the RIGHT$(X$,5) letters in the string. Since you know the length, and it is already in the B register, this poses few problems:

```
START     LDX #$7FE0     POINT TO THE STRING WITH X
          LDY #$6000     TEMPORARY STORAGE AREA
          SUBB #5        SUBTRACT # OF CHARS FROM LENGTH
          LEAX B,X       POINT TO RIGHT 5 CHARS
LOOP      LDA ,X+        LOAD A WITH CHARACTER
          BEQ FOUND      HAVE WE FOUND THEM ALL?
          STA ,Y+        NO, SO STORE IT IN BUFFER
          BRA LOOP       GO BACK FOR ANOTHER ONE
FOUND     'YES, THE RIGHT$(X$,5) IS NOW AT $6000
```

Now that we have shown in detail how some of the BASIC keywords are translated in assembly language, it should be easier for you to translate other commands and functions. At any rate, these subroutines, spruced up a bit, will make your job as a programmer much simpler. At the very least, this small dictionary will have fullfilled its purpose in making assembly language a bit less mysterious. Above all, I must stress: *Do not be satisfied with the routines I have shown you*! The only way to learn anything is to do it. Find other and better ways to do these functions. The world of assembly is out there waiting for you to master it, but you can only start at the beginning.

(Questions or comments regarding this tutorial may be directed to the author at 1173 Niagara Street, Denver, CO 80220. Please enclose an SASE when requesting a reply.)

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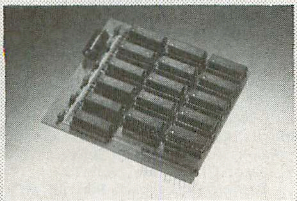

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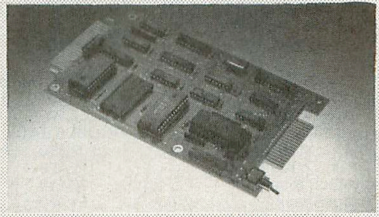

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357,550 ★Martin Parada, Arcadia, CA
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ZORK I *(Infocom)*
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ZEUS *(Aardvark)*
4,500 ★Benoit St-Jean, Gatineau, Quebec
3,380 Martin Kertz, Forrest City, AR

— Jody Doyle

SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints, tips or responses to questions, or want help yourself, we encourage you to write to the Scoreboard, c/o THE RAINBOW.

In response to questions from:

- Deborah Micallef: In *Black Sanctum*, make sure you have all of the materials and take them to the room with the coffin. You may be missing the bedsheet.

In *Shenanigans*, how do you get past the snake?

In the *Interbank Incident*, what do you do in the back rooms of the Louvre and the museum in Seattle? How do you enter the apartment in Seattle? I have unlocked the door with both keys, but I still can't get in.

In *Sea Quest*, to get past the pirate, you must give him the pearl. Where is Bashan, and how do you get there?

Jim Forster
Medina, OH

- Quinn Granfor: In *Rogue*, when the amulet is obtained, take it back to Level 1.

How do you convince the screening door in *Hitchhiker's Guide to the Galaxy* that you have the ability to time-travel? After you put the towel around your head, what do you do to get out of the beast's lair?

In *Wishbringer*, drop everything, get the dead branch off the tree, go to the pit, pick up the platypus with the branch, and dig in 'X'. Then give the hat to the pelican. How does the seahorse aid you?

Matt Smith
Spotsylvania, VA

Scoreboard:

How do I get the owl and the small shovel in *Dallas Quest*?

Julie Finn
Fort Smith, AR

Scoreboard:

In *Sea Search*, I know the ring is in an obvious place that I have overlooked, because many people wrote in saying they had it, but I can't seem to find it. And yes, there is another treasure besides the anchor, pearl, silver and ring.

Chris Amato
Long Island, NY

Scoreboard:

In *Pyramid 2000*, don't waste your coins on batteries. To set the vase down, you need to set it on the pillow.

Darren King
Yorkton, Saskatchewan

Scoreboard:

In *Vortex Factor*, how do you get the battery working in the time machine, and how do you open the safe? When I look for the document in the desk it says there is nothing special here.

Jamin Dorward
Canton, OH

Scoreboard:

In *Raaka-Tu*, I have the food, the sword, lamp, lever, candle, idol and ring, but how do I get to the gargoyle room?

In *Dungeons of Daggorath*, how do you kill the image of the wizard?

Matthew Lohse
Camarillo, CA

Scoreboard:

After I get the plant in *Trekboer*, I can't get out of the underground complex. How do you kill the spider?

Chris Owens
Mohawk, NY

Scoreboard:

In *Magic of Zanth*, try typing `EXAMINE GROUND` at the crevice of the nickelpedes.

Robert D. Williams
Yellowknife, Northwest Territory

Scoreboard:

In *Shenanigans*, where is the clover field and the woman who is supposed to be in it?

Jeremy Carter
Spring Lake Park, MN

Scoreboard:

In *Gates of Delirium*, I can only find the extra party member, Gazer. Where can I find any others?

Ian Fuchs
St. Albert, Alberta

Scoreboard:

In *White Fire of Eternity*, in the underground tunnel at the corner of the corridor, when I go south I can't breathe! Please help!

Noah Burns
Peru, NY

Scoreboard:

I have solved Level 1 in *Robot Odyssey I*, but on Level 2, I can't get the subway pass the sentry is guarding. I have tried the red robot, but it won't pick it up. The magnet won't detect it either.

John Riddle
Linthicum, MD

Scoreboard:

In *Zork I*, how do you get past the gate to Hades?

In *Sands of Egypt*, drain the pool by using the scepter. Drop the scepter on the mummy in the mummy room.

Jeff Arey
Bucksport, ME

Scoreboard:

In *Downland*, which key do you have to get in order to get into Chamber 8?

In *Pyramid 2000*, how do you get past the bottomless pit?

In *Gantelet*, how do you get past Level 8?

Trevor Goode
Bardstown, KY

Scoreboard:

How can I enter the pyramid in *Graphic Pyramid*? I'm in front of the pyramid's doors, with vines, etc., and no word works.

In *Shenanigans*, how do I use the pole and what do I do with the glass of beer? How can I cross over the rainbow?

In *Major Istar*, how do I make the vaccine against the radiation?

German Moure
Buenos Aires, Argentina

Scoreboard:

In *Ghostown*, how do you open the safe and get by the snake so you can dig?

Alan Coe
Trail, British Columbia

To respond to other readers' inquiries and requests for assistance, reply to "Scoreboard Pointers," c/o THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We will share your reply with all "Scoreboard" readers in an upcoming issue.

For greater convenience, "Scoreboard Pointers" and requests for assistance may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type `SEND` and address to: `EDITORS`. Be sure to include your complete name and address.

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Great for 512K Systems! From Color Venture and OWL-WARE

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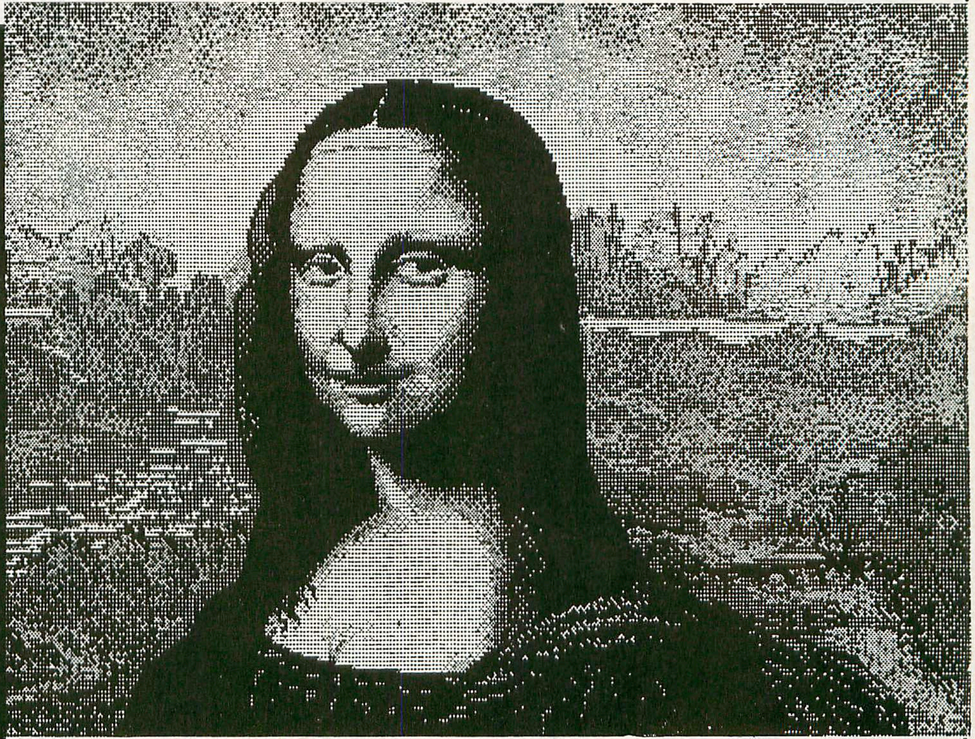

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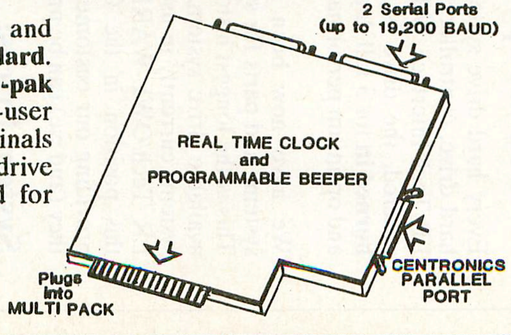

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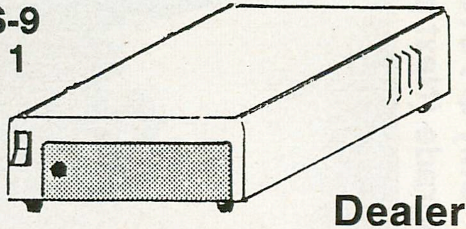

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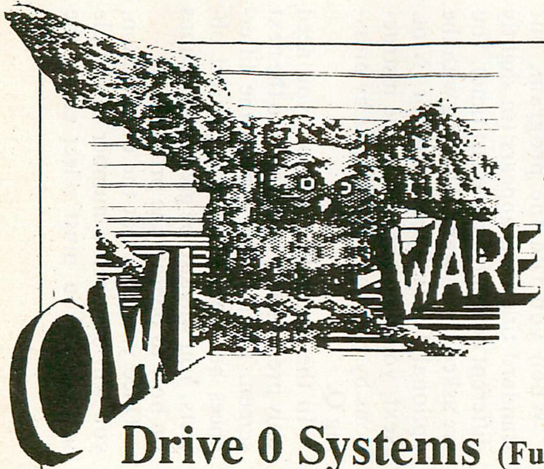

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Grammar 101 Part II

By Fred B. Scerbo
Rainbow Contributing Editor

If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, and don't forget this is* BASIC. *All programs resulting from your wishes are for your use, but remain the property of the author.*

Several months ago I introduced a program called *Sentence Structure 1* (January 1988, Page 90) to bring the world of learning English grammar skills into the memory of your Color Computer. Designed more for junior high or high school students than elementary schoolers, the program allowed the user to scan a set of complete sentences and then pick out the simple subjects and simple predicates. As with most of my "Wishing Well" software, the program was also designed to allow you to add your own examples in the `DATA` statements at the end of the program. This seems to be a feature most of you like, judging from my mail.

This month we will examine another field of English grammar with *Sentence Structure 2: Recognizing Direct and Indirect Objects.* The program, which requires at least 16K, will include many of the features of the first program with a few added twists.

Truly Educational???

Many readers will recall my endless monologues about how much of the commercially available software claiming to be educational really isn't. In fact, several programs that have appeared in these pages in the past have tried to address the problem of being "just another quiz of material you already know."

Sentence Structure 2 is designed not only to quiz the user on the identification of both direct and indirect objects in complete sentences, but also to help the student actually learn their use. The beginning of the program contains an instruction section; besides containing the instructions for running the program (another reader request), this section also teaches identification of direct or indirect objects.

For those of you who may be a little rusty on the "hows and whys" of English grammar, a direct object is a word naming the thing that is being acted upon by the verb. For example, in the sentence:

He mailed me a letter.

Letter is the thing that is *mailed.* To check, we ask ourselves:

Mailed *what*?

Mailed the *letter*!

The direct object answers the question "what?" after the verb.

The indirect object, on the other hand, names the person or thing to whom or to which the action is directed. In the same sample sentence, the indirect object is the word *me.* Using the verb *mail*, we would ask the question:

Mailed to *whom*?

Mailed to *me*!

Sentences can have direct objects without having indirect objects, such as in the sentence:

He mailed the letter.

Letter is still the direct object in this sentence because it answers the question "mailed *what*?"

Why on Computer?

Why are we using the computer to study this grammar skill? To be honest, repetition is the most effective way to master certain English skills. By reviewing and quizzing this material on the computer, the following is accomplished:

- We allow the student to pace himself or herself through the material at an appropriate rate. The computer always waits for the student's response.
- We allow the same material to be presented in a new and random way without becoming too familiar.
- We provide the material in the least restrictive and most interesting fashion: on a computer screen.
- The student must still use all his regular reasoning functions and accumulated skills to successfully proceed with the program. Reading, writing, and keyboarding skills are also enhanced as a bonus.

Using the Program

When you run the program, our standard title card appears (in slightly different colors from the last time). You are asked if you want (T)alking with the optional Tandy Speech Pak, or (N)ot. Next, you may proceed to the instructions by pressing I or the quiz by pressing Q.

In the instruction section, you need only press ENTER to advance to the next screen. The text will explain the differences between direct and indirect objects. You will also be given instructions on how to operate the program.

Once you arrive at the quiz section, you will be given a number of sample sentences. You must select either the

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direct or indirect object and enter it using the keyboard. Pressing the @ symbol brings you to the score card. From the score card, pressing C will continue the program.

The computer will next tell you if you are correct or incorrect. After both parts have been answered, the screen will review the sentence, pointing out the verb and its relation to both the direct object and indirect object. At the conclusion, the score card will show you how well you have done.

Adding Your Own Sentences

If you find this program useful, you can add up to 50 of your own sentences for review. To delete my data, type and enter:

```
DEL 999-4999
```

Line 5000 must read:

```
5000 DATA END,END,END,END
```

For each sentence you enter, you must have four pieces of information, separated by a comma: the sentence, the direct object, the indirect object and the verb. For example, in the sentence "He mailed me a letter," the `DATA` line should read:

```
1000 DATA HE MAILED ME A
LETTER.,LETTER,ME,MAILED
```

If your sentence is going to use commas, be sure to wrap each piece of information in quotation marks:

```
1000 DATA "YESTERDAY, HE
MAILED ME A LETTER.",
"LETTER","ME","MAILED"
```

I know I have explained this technique many times, but some readers might be new to the "Wishing Well"; I want to avoid a bag of letters asking, "Why do I keep getting an OD Error?" Always check your data for errors.

As always, save your program to tape or disk with a different filename from the original version with my data. You can accumulate a collection of programs with your own data that will be useful to your child or students as they advance.

Conclusion

Many of you have written to say that a particular program has helped your son or daughter get through a difficult subject. Hearing this makes me very satisfied. Therefore, keep submitting ideas on subjects you would like to see covered; I may be able to grant your wish.

Also, to those who have sent in their old used CoCos for my special needs students: They have been extremely helpful, and I cannot thank you all enough. □

40	91	440	106
125	94	525	181
200	35	1010	135
240	80	END	120
355	31		

The listing: SENTENCE

```
1 REM ************************
2 REM * RECOGNIZING DIRECT   *
3 REM * AND INDIRECT OBJECTS *
4 REM *    BY FRED B.SCERBO   *
5 REM *  60 HARDING AVE.     *
6 REM * NORTH ADAMS,MA 01247 *
7 REM *  COPYRIGHT (C) 1988  *
8 REM ************************
9 CLEAR3000
10 CLS0:FORI=1TO64:PRINTCHR$(172
);:NEXT
15 FORI=1TO192:READA:PRINTCHR$(A
+128);:NEXT
20 DATA126,124,124,120,53,60,60,
53,60,56,59,48,58,60,61,60,56,62
,60,53,50,53,53,60,60,53,60,56,1
12,126,124,124
25 DATA122,,,,52,60,61,53,56,,58
,57,58,,53,,48,62,48,53,52,55,53
,,,53,56,,112,122,,
30 DATA123,115,115,114,52,60,60,
52,60,56,56,,56,,52,,48,60,60,52
,48,52,52,60,60,52,60,56,112,123
,115,115
35 DATA80,,80,122,124,125,124,12
0,126,124,122,122,80,117,117,124
,124,124,116,124,126,124,117,80,
80,122,126,124,122,122,112,112
40 DATA80,80,80,122,80,117,80,80
```

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```
,126,126,120,122,80,117,117,80,8
0,80,80,80,122,80,117,80,,122,12
6,126,120,122,,80
45 DATA123,115,115,122,80,117,11
2,,122,116,114,123,115,119,117,1
15,115,115,112,80,122,,117,115,1
15,122,122,116,114,123,115,115
50 FORI=1TO64:PRINTCHR$(163);:NE
XT
55 PRINT@357," RECOGNIZING DIRE
CT   ";:PRINT@389," AND INDIRECT
 OBJECTS  ";:PRINT@421," (T)ALKI
NG OR (N)OT ?  ";
60 PRINT@453,"   BY FRED B.SCERB
O  ";
65 PRINT@485,"  COPYRIGHT (C) 19
88   ";
70 X$=INKEY$:XX=RND(-TIMER):IFX$
="T"THEN90
75 IFX$="N"THEN85
80 GOTO70
85 NT=1:GOTO150
90 CLS0
95 XX=&HFF00:YY=&HFF7E
100 POKEXX+1,52:POKEXX+3,63
105 POKEXX+35,60:GOTO150
110 IFNT=1THENRETURN
115 FORII=1TOLEN(AA$)
120 IF PEEK(YY)AND 128=0 THEN120
125 POKEYY,ASC(MID$(AA$,II,1))
130 NEXTII
135 IFPEEK(YY)AND128=0THEN135
140 POKEYY,13
145 FORI=1TO1000:NEXT:RETURN
150 SW=31
155 CLS:PRINT@228,"(I)NSTRUCTION
 OR (Q)UIZ";
160 X$=INKEY$:IFX$="Q"THEN250ELS
EIFX$="I"THEN165ELSE160
165 CLS0
170 CLS:PRINT:JK$="   IN THIS PR
OGRAM WE WILL QUIZ YOUR KNOWLEDG
E OF DIRECT OBJECTS AND INDIRECT
 OBJECTS.":GOSUB260
175 PRINT:JK$="   BEFORE WE DO T
HAT WE MUST DEFINE SOME TERMS.":
GOSUB260
180 PRINT:JK$="   FIRST, A DIREC
T OBJECT IS A WORD IN A SENTENCE
 WHICH RECEIVES THE ACTION EXPRE
SSED BY THE VERB.":GOSUB260
185 GOSUB530
190 CLS:PRINT:JK$="   IN THE SEN
TENCE, 'I GAVE MY GIRLFRIEND A D
IAMOND RING', THE WORD 'RING' IS
 THE DIRECT OBJECT.":GOSUB260
195 PRINT:JK$="   'RING' RECEIVE
S THE ACTION EXPRESSED BY THE VE
RB 'GAVE'.":GOSUB260
200 PRINT:JK$="   THE DIRECT OBJ
ECT ANSWERS THE QUESTION 'GAVE W
HAT?'. I 'GAVE' THE 'RING' (DIRE
CT OBJECT).":GOSUB260
205 GOSUB530
210 CLS:PRINT:JK$="   THE INDIRE
CT OBJECT NAMES THE THING OR PER
SON TO WHOM THE ACTION IS DIRECT
ED.":GOSUB260
215 PRINT:JK$="   IN THE SENTENC
E, 'I GAVE MY GIRLFRIEND A DIAMO
ND RING', THE WORD 'GIRLFRIEND'
IS THE INDIRECT OBJECT.":GOSUB26
0
220 PRINT:JK$="   'GIRLFRIEND' T
ELLS TO WHOM THE ACTION OF THE V
ERB 'GAVE' IS EXPRESSED.":GOSUB2
60
225 GOSUB530
230 CLS:PRINT:JK$="   IN THE FOL
LOWING QUIZ YOU WILL BE ASKED TO
 IDENTIFY BOTH THE DIRECT OBJECT
 AND THE INDIRECT OBJECT IN A SA
MPLE SENTENCE.":GOSUB260
235 JK$="   SIMPLY TYPE IN THE C
ORRECT ANSWER. THE COMPUTER WILL
 TELL YOU IF YOU ARE CORRECT OR
INCORRECT.":GOSUB260
240 JK$="   PRESSING THE <@> KEY
 WILL SHOW YOUR SCORE. YOU MAY P
RESS <C> TO CONTINUE THE QUIZ. G
OOD LUCK.":GOSUB260
245 GOSUB530
250 CLS0:DIMAO(50),A$(50),D$(50)
,I$(50),V$(50),NP(50)
255 CLS0:GOTO295
260 AA$=JK$:GOSUB110
265 IF LEN(JK$)<=SW THEN285
270 FOR T=SW TO 0STEP-1:IF MID$(
JK$,T,1)=" "THEN280
275 NEXT T:GOTO285
280 L$=LEFT$(JK$,T):W$=L$:GOSUB2
90:JK$="   "+RIGHT$(JK$,(LEN(JK$
))-T):GOTO265
285 W$=JK$:PRINTW$:RETURN
290 PRINTW$:RETURN
295 FORJ=1TO50:READ A$(J),D$(J),
I$(J),V$(J):IF A$(J)="END" THEN3
05
300 NEXTJ
305 REM START QUIZ
310 J=J-1:FORI=1 TO J
315 AO(I)=RND(J)
320 IF NP(AO(I))=1 THEN 315
325 NP(AO(I))=1:NEXTI
330 FOR Y=1TO1000:NEXTY
335 GOTO475
340 FX=0:CLS
345 PRINT@35,"HERE IS EXAMPLE NU
MBER";P
350 RETURN
355 AA$="   WHAT IS THE DIRECT O
BJECT   OF THIS SENTENCE ?":
```

```
:GOSUB110:PRINT@96,AA$
360 PRINT@192,"";:JK$="     "+A$(A
O(P)):GOSUB260
365 PRINT:PRINT"    =>  ";:LINEINP
UTA$
370 IFA$="@"THENGOSUB545
375 IF FX=1 THENGOSUB340:GOTO355
380 IF A$<>D$(AO(P))THEN395
385 PRINT:JK$="    YOU ARE CORREC
T! THE DIRECT OBJECT IS: "+D$(AO
(P)):GOSUB260
390 CR=CR+1:GOTO405
395 PRINT:JK$="    WRONG! THE COR
RECT DIRECT OBJECT IS: "+D$(AO(P
)):GOSUB260
400 IR=IR+1
405 GOSUB530
410 RETURN
415 AA$="    WHAT IS THE INDIRECT
            OBJECT OF THIS SENTE
NCE ?":GOSUB110:PRINT@96,AA$
420 PRINT@192,"";:JK$="     "+A$(A
O(P)):GOSUB260
425 PRINT:PRINT"    =>  ";:LINEINP
UTA$
430 IFA$="@"THENGOSUB545
435 IF FX=1 THENGOSUB340:GOTO415
440 IF A$<>I$(AO(P))THEN455
445 PRINT:JK$="    YOU ARE CORREC
T! THE INDIRECT OBJECT IS: "+I$(
AO(P)):GOSUB260
450 CR=CR+1:GOTO465
455 PRINT:JK$="   SORRY! THE COR
RECT INDIRECT OBJECT IS: "+I$(AO
(P)):GOSUB260
460 IR=IR+1
465 GOSUB530
470 RETURN
475 FORP=1TOJ
480 WW=RND(2):IFWW=1THEN490
485 FX=0:GOSUB340:GOSUB355:GOSUB
340:GOSUB415:GOTO495
490 FX=0:GOSUB340:GOSUB415:GOSUB
340:GOSUB355
495 CLS
500 PRINT@32,"";:JK$="    IN THE
SENTENCE '"+A$(AO(P))+"', ":GOSUB
260
505 PRINT:JK$="    THE DIRECT OBJ
ECT, '"+D$(AO(P))+"', IS THE THI
NG WHICH IS BEING ACTED UPON BY
THE VERB, '"+V$(AO(P))+"'":GOSUB
260
510 JK$="    WHILE THE INDIRECT O
BJECT, '"+I$(AO(P))+"' NAMES TO
WHOM OR WHAT THE ACTION OF THE V
ERB IS DIRECTED.":GOSUB260
515 GOSUB530
520 NEXT P
525 GOSUB545:RUN
530 PRINT@483," PRESS <ENTER> TO
 CONTINUE";
535 X$=INKEY$:IFX$<>CHR$(13)THEN
535
540 RETURN
545 CLS:PRINT:PRINT:PRINT
550 PQ=CR+IR:IF PQ=0THEN PQ=1
555 PRINT"    NUMBER CORRECT = "
CR
560 PRINT
565 PRINT"    NUMBER WRONG   = "
IR
570 PRINT:PRINT"    STUDENT SCOR
E  = ";INT(CR*100/PQ);"%"
575 PRINT:PRINT"    ANOTHER TRY
(Y/N/C)";
580 W$=INKEY$:IF W$=""THEN580
585 IF W$="C"THEN FX=1:RETURN
590 IF W$="Y" THEN RUN
595 IF W$="N" THEN CLS:END
600 GOTO580
990 REM ENTER DATA AT LINE 1000
IN THIS ORDER: SENTENCE, DIRECT
OBJECT, INDIRECT OBJECT,VERB
1000 DATA I MAILED MY BROTHER A
LARGE PACKAGE.,PACKAGE,BROTHER,M
AILED
1010 DATA MY UNCLE GAVE ME A NEW
 FOOTBALL HELMET.,HELMET,ME,GAVE
1020 DATA WILL YOU TELL ME A BED
TIME STORY?,STORY,ME,TELL
1030 DATA DON'T ASK ME ANY MORE
QUESTIONS,QUESTIONS,ME,ASK
1040 DATA I JUST BOUGHT MYSELF A
BRAND NEW AUTOMOBILE.,AUTOMOBIL
E,MYSELF,BOUGHT
1050 DATA FEED YOUR CAT THIS BRA
ND OF CAT FOOD.,BRAND,CAT,FEED
1060 DATA HE SENT ME A BEAUTIFUL
 BIRTHDAY CARD FOR MY BIRTHDAY.,
CARD,ME,SENT
1070 DATA COULD YOU LEND ME TEN
DOLLARS UNTIL TUESDAY?,DOLLARS,M
E,LEND
1080 DATA I DO NOT OWE YOU ANYTH
ING.,ANYTHING,YOU,OWE
1090 DATA THE BROKER OFFERED US
A GOOD PRICE FOR THE PROPERTY.,P
RICE,US,OFFERED
1100 DATA WE SENT HARRY A NEW TI
E.,TIE,HARRY,SENT
1110 DATA THOMAS OFFERED BILL A
NEW JOB AT THE OFFICE.,JOB,BILL,
OFFERED
1120 DATA BRING ME THE LATEST CO
PY OF THE RAINBOW.,COPY,ME,BRING
1130 DATA THE TEAM GAVE THE COAC
H A TROPHY FOR HIS HARD WORK.,TR
OPHY,COACH,GAVE
1140 DATA I SOLD HIM THE FIRST H
OUSE HE LOOKED AT.,HOUSE,HIM,SOL
D
5000 DATA END,END,END,END
```

Two patches, a hardware modification and an alternative to the PALETTE command

CoCo 3 Potpourri

By Michael F. Wiens

I guess I am one of the "old men" of the CoCo Community. At least I feel like an old man when I remember how fantastic my new CoCo seemed back in 1980 and how far the CoCo 3 surpasses it today. My trusty CoCo 1 (Serial Number 9372) served me well, outlasting three keyboards, three memory upgrades, and numerous hardware modifications and explorations. However, I knew it was time to retire it when the CoCo 3 came along.

I don't intend to give you another glowing overview of the CoCo 3. That has been admirably handled several times here in THE RAINBOW since Tandy's first announcement.

In this article, instead, I want to give you some hard facts based on my first month with the machine. I'll touch on three areas: patches for two bugs I found in the new Super Extended portion of BASIC, a very simple hardware modification for those of you with the old black-case CoCo 1 Disk Controllers, and an alternative to the PALETTE command that will make your graphics programs *really* fly when rotating colors through the palette registers, as Rick Adams and Dale Lear did in the program *Rainbow Tunnel* (RAINBOW, October 1986). This new USR routine updates the palette slots 16 times faster than the PALETTE command.

Michael Wiens works as a firefighter while he pursues a degree in computer science. He has been a CoCo enthusiast since the purchase of his first CoCo eight years ago.

New System, New Bugs

It seems to be a fact of life that when first released, new computer systems will have some undiscovered bugs. This is probably because eager new users put the machine through paces never anticipated by the software authors. Here are the first two that I've run across, although I'm sure more will turn up. Listing 1 is a short program that fixes both bugs. I recommend that the non-REM lines from Listing 1 be included in all your programs that may need them, because the patches will be wiped out whenever you do a reset, either cold or warm. Re-installing the patches whenever your program runs is perfectly OK, and neither patch requires allocation of any user memory.

The first bug is in the code that handles PALETTE RGB and PALETTE CMP. These two commands restore the palette registers to the default values for your type of monitor. They keep you out of trouble if your graphics program ends with the foreground and background registers both set to the same color or in some other unusable combination. However, because of a counter initialized to the wrong value, these commands only restore the first 15 registers. This won't often be a problem, but it can lead to some head-scratching at times. Fortunately, it can be fixed with a single poke, since the whole system is transferred to RAM on power-up or reset in the CoCo 3. Fixing this bug is important if you plan to use the nifty USR routine I'm going to show you later.

The second bug is not as minor as the first, but the fix for it is only 32 bytes long and can be placed in a section of RAM not used by BASIC. On 40- and 80-column screens, the PRINT statement does not correctly handle the printing of tabs, either explicit (as in 'PRINT TAB(8)A$') or implicit (as in 'PRINT A,B'). For example, key in the following two lines and run them in the 32-column mode and again in the 40- or 80-column mode:

```
10 PRINT "HI","THERE"
20 PRINT "HELLO","THERE"
```

You would expect "THERE" to be in the same column in both lines when this is run, but on the two wide screens it appears three columns to the right in the second line.

After several lengthy sessions with the disassembler, I traced the problem to the routine that sets up the tab table for the current device just before each tab is performed. Somehow the fact that the 40- and 80-column screens are new devices was overlooked. When the system printed on the wide screens, it used the cursor position, tab widths and maximum tab position from the old 32-column screen. The fix: Jump out of this routine if a video screen is selected, determine the screen width, set the tab table accordingly and jump back in. In order to do this, I also had to locate several new BASIC pointers. Since these may be of general interest I have included the source code for the patch in Listing 1.

CoCo 1 Hardware Compatibility

When Tandy introduced the CoCo 2, one of the first things users discovered was that the disk controllers for the CoCo 1 wouldn't work with the CoCo 2. Eventually someone figured out that the 12-volt power supply had been eliminated from the CoCo 2 since the new controller didn't need it. If you owned one of the older controllers and wanted to upgrade to a CoCo 2, you had three choices: Buy a new CoCo 2 compatible controller, buy a Multi-Pak Interface (at $100), or open your new CoCo 2 (voiding the warranty) and add a 12-volt power supply under the keyboard (see "Turn of the Screw," RAINBOW, April 1984). This was never a widespread problem, since the CoCo 2 is pretty much the same machine as the old CoCo 1; not that many people wanted to move up.

However, the problem has resurfaced in a big way with the release of the CoCo 3. The new machine simply has too many advantages to be ignored, and many of us "old-timers" want to upgrade. Here, then, is a fourth alternative for those of you with the old black-case CoCo 1 disk controller who want to upgrade to a CoCo 2 or CoCo 3. Since I didn't want to open the case and void the warranty on my brand-new computer, I attacked the problem from the other end. On exploration, I found 12 volts available in each of my disk drives (one a Tandy and the other not). I suspect that this is the case with all 5¼-inch drives, but I can't guarantee it. I also found several unused leads in the ribbon cable that runs from the drives to the controller. From this point, it was a simple task to route the 12 volts back to the controller.

Those of you with hardware savvy are probably already running for the soldering irons. For those needing a little more help, read on. Lead 2 in the ribbon cable is the one we want to use, since it isn't in use and isn't tied to ground at the controller or in any of the drives I have examined. You should check all drives in your system to make sure Lead 2 isn't grounded; otherwise, putting 12 volts on it will cause a short-circuit. If it is grounded in one or more of your drives, you need to isolate it by cutting the trace on the board in that drive, preferably where the ribbon cable plugs into the circuit board in the drive. Don't cut Lead 2 in the cable.

You will need to open your disk controller and the drive you decide to steal the 12 volts from. To open the controller, carefully peel off the label from the top (it can be replaced later); remove the screw hidden underneath. Gently pry the top off, remove the two screws holding the board in the case, and remove the board. At the end of the board opposite the screws, you will see two snap-in rivets that hold the RF shield in place. These should be gently pried out and the RF shield removed, since we want to make connections on the bottom of the board.

Now, with the board upside down and the ribbon cable connection on your right, Lead 2 is the lead nearest to you, on the right side of the board. Solder an 8-inch piece of 28-gauge solid-core wire to this lead. Make the connection as close to the inside end of this and all other leads as you can, so that the connector will still slide on.

The other end of this wire attaches to a lead on the connector at the other end of the board. This is also Lead 2 on this connector. Again, it is the closest lead to you. You can recognize it easily because it is wider than the other leads on that connector. After you have made both of these solder connections, reverse your steps to put the controller back together.

After opening whichever drive you want to draw 12 volts from, locate Lead 2 where the ribbon cable connects to the circuit board in the drive. It is the bottom pin on the connector, on the outside of the drive. Solder one end of a 10-inch piece of solid-core wire to the end of this lead, and locate a point from which to draw 12 volts. I can't help you with specifics here, since drives will vary with make and model. However, somewhere on the board there will be a connector from the drive power supply. Four wires go into it: two ground wires, one 5-volt wire and one 12-volt wire. It should be easy to locate the four points at which the socket for this connector is soldered to the board and to test them with a voltmeter to find which is 12 volts. The other end of the 10-inch wire goes here. You may also find other 12-volt supply points on the board if it is well-labeled; unfortunately, many aren't.

Once the connections are made and checked for short circuits and bad connections, you should again have a working disk system. The only sticking point is that now you must turn on the drive before (or at the same time as) the computer. This is because the 12 volts must be supplied to the WD1793 chip in the controller before or at the same time the 5 volts is supplied. I recommend using an outlet strip to turn your whole system on and off. It takes care of this problem and is also a more convenient way to boot your system.

Rainbow Tunnel Revisited

The first program I keyed in when I finally got my hands on the CoCo 3 was *Rainbow Tunnel*. It is a truly amazing demonstration and shows quite well the super possibilities of our new machine.

After the initial amazement wore off, I noticed that even with the clock speed doubled, there was a noticeable "ripple" effect from the center out as each of the palette slots was changed. I began to wonder about a way to change all 16 slots at once, and I hauled out my disassembler to begin looking around in the new system. I found that the `PALETTE CMP` and `PALETTE RGB` commands point to a string of 16 bytes in ROM and then call a routine to reset all 16 slots from the values in that string. From there, it was a snap to write a `USR` routine to do the same thing. It is probably the shortest `USR` routine ever written, since it is only two instructions long. It simply points the `X` register at the string and jumps into the same routine that `PALETTE RGB` and `PALETTE CMP` use.

To use this technique, install the `USR` routine as shown in lines 100 through 140 of Listing 2. Then call it with a 16-byte string of color values as a parameter, such as: `A$=USR0(C$)`. The color values in the string will be placed in the palette slots, with the first byte in the string going to Slot 0, the second byte going to Slot 1, etc. Make sure the string you use is at least 16 bytes long, or the slots beyond the end of the string will be set to unpredictable values.

Listing 2 duplicates the original *Rainbow Tunnel* program using this faster technique. I have added a timing loop that can be adjusted with the up and down arrow keys. Notice that there is no visible ripple as the colors change, even when the program is looping quite slowly. When you want to change only one or two palette slots at a time, it is probably easier to use the `PALETTE` command than to manipulate the 16-byte string that this `USR` routine requires. When you must change most or all of the registers *fast*, however, this is the way to go. Again, for those that are interested in the nuts and bolts, I have included the source code for the `USR` routine in Listing 2.

Now It's Your Turn

I hope the information I have provided here will help some of you new CoCo 3 owners get more from this wonderful computer. It is quite exciting for me to begin exploring a brand-new machine. However, one thing the last six years should have taught us is that, alone, no one can expect to learn everything about a system. We successfully opened up the original CoCo system by using THE RAINBOW as a communication center to contribute our findings. Now we can do the same thing again with the CoCo 3. I will be waiting with the rest of you each month to see what tidbits someone else has learned about my (new) favorite computer.

(Questions or comments concerning these modifications may be directed to the author at 1905 Spruce St., La Grande, OR 97850. Please enclose an SASE when requesting a reply.) ☐

Listing 1: CC3PATCH

```
1 'COCO 3 PATCH - NOVEMBER 23, 1
986
2 '
3 ' BY MICHAEL F. WIENS
4 '    1905 SPRUCE ST.
5 '    LA GRANDE, OREGON  97850
6 '    PHONE (503) 963-6991
7 '
8 '
9 'THIS PROGRAM PATCHES 2 BUGS I
N THE COCO 3 SYSTEM:
10 ' 1) FORCES 'PALETTE CMP' AND
 'PALETTE RGB' TO RESET ALL SIXT
EEN COLOR SLOTS, INSTEAD OF ONLY
 FIFTEEN.
11 ' 2) CORRECTS HANDLING OF TAB
S ON THE HI-RES TEXT (40 AND 80
CHAR) SCREENS.
12 '
13 '
14 ' THE NON-REM LINES HERE SHOU
LD BE INCLUDED IN ALL YOUR PROGR
AMS, SINCE THE PATCHES WILL NOT
REMAIN IN EFFECT AFTER A RESET,
EITHER WARM OR COLD.
15 '
19 'FIRST, PATCH PALETTE COMMAND
 - ONLY TAKES A SINGLE POKE:
20 POKE &HE649,&H10
26 '
27 'NOW, PATCH THE PRINT ROUTINE
S TO PROPERLY TAB ON WIDE SCREEN
S.
28 '
39 'PUT NEW ROUTINE IN PLACE: I
CHOSE TO PUT IT IN A PORTION OF
THE MEMORY WHICH IS ONLY USED ON
 POWER-UP AND RESET.  THIS DOESN
'T USE ANY BASIC PROGRAM MEMORY.
40 B=&HF09D:FORX=0TO31:READ HX$:
POKE X+B,VAL("&H"+HX$):NEXT
48 '
49 'HERE IS THE CODE
50 DATA 86,28,D6,E7,26,07,D6,89,
C4,1F,7E,A3,77,C1,01,26,05,8E,10
,20,20,04,48,8E,10,40,F6,FE,02,7
E,A3,7C
58 '
59 'NOW PUT PATCH IN PLACE TO PA
SS CONTROL TO THE NEW ROUTINE.
60 B=&HA373:POKE B,&H7E:POKE B+1
,&HF0:POKE B+2,&H9D:POKE B+3,&H1
2
90 '
100 'HERE IS THE SOURCE CODE, FO
R THOSE THAT ARE INTERESTED. WE
 ARE PATCHING THE ROUTINE THAT S
ETS TAB PARAMETERS FOR EACH I/O
DEVICE. THE PATCH CODE SETS UP
THE REGISTERS AND THEN JUMPS BAC
K TO THE APPROPRIATE RE-ENTRY PO
INTS.
110 '
120 '          THE PATCH:
130 '          ORG  $A373
140 '$A373     JMP  PATCH
150 '$A376     NOP
160 '
170 '          NOW THE NEW CODE
180 '          ORG  $F09D
190 'PATCH     LDA  #40 = MAXIMUM
CHARACTERS PER LINE
200 '          LDB  $E7 = MODE SWI
TCH: 0=32, 1=40, 2=80 CHAR
210 '          BNE  WIDE  IF 1 OR 2
, SKIP AHEAD
220 '
230 '          MUST BE A 32 CHAR SC
REEN
240 'NARROW    LDB  $89 = LSB OF C
URSOR POSITION
250 '          ANDB #$1F CONVERT TO
 LINE POSITION
260 '          JMP  $A377 RETURN TO
 REST OF THE OLD REGISTER SET-UP
 ROUTINE
270 '
280 '          IT'S EITHER A 40 OR
80 CHAR SCREEN
290 'WIDE      CMPB #1 WIDE OR WIDE
R?
300 '          BNE  WIDER
310 '          LDX  #$1020 = COLUM
N WIDTH AND MAXIMUM TAB POSITION
320 '          BRA  OUT
330 '
340 '          MUST BE AN 80 CHAR S
CREEN
350 'WIDER     ASLA  CHANGE NUMBER
OF CHARACTERS PER LINE TO 80
360 '          LDX  #$1040 = COLUM
N WIDTH AND MAXIMUM TAB POSITION
370 'OUT       LDB  $FE02 = HI-RES
 CURRENT LINE POSITION
380 '          JMP  $A37C REGISTERS
 ARE SET, GO PUT THEM IN PLACE
```

Listing 2: TUNNLMOD

```
1 'RAINBOW TUNNEL, REVISITED
2 '
3 'DEMONSTRATION OF A SPEEDIER A
LTERNATIVE TO THE PALETTE COMMAN
D
4 '
5 'ORIGINAL 'RAINBOW TUNNEL' BY
RICK ADAMS AND DALE LEAR
6 '
7 'MODIFICATIONS, AND ADDITION O
F A NEW USR ROUTINE BY
8 '
9 '      MICHAEL F. WIENS
10 '     1905 SPRUCE ST.
11 '     LA GRANDE, OREGON  97850
12 '     (503) 963-6991
13 '
14 '
99 'RESERVE MEMORY FOR NEW PALET
TE CODE
100 CLEAR 1000,&H7FF0
118 '
119 'DATA FOR NEW PALETTE CODE
120 DATA AE,02,7E,E6,34
128 '
129 'PUT THE CODE IN PROTECTED R
AM AND TELL BASIC ABOUT IT
130 FOR X=&H7FF0 TO &H7FF4:READ
Z$:POKEX,VAL("&H"+Z$):NEXT
140 DEFUSR0=&H7FF0
148 '
149 'FIX BUG IN 'PALETTE CMP' AN
D 'PALETTE RGB'
150 POKE&HE649,&H10
158 '
159 'SET HIGH CLOCK SPEED, BREAK
 KEY VECTOR, AND INITIALIZE VARI
ABLES
160 POKE&HFFD9,0:DIMC$(15):T=1:O
N BRK GOTO270
168 '
169 'SET UP COLOR STRINGS AND RE
SET PALETTE
170 HSCREEN2:DATA49,50,51,52,53,
22,23,24,55,56,57,58,59,60,61,62
180 C$(0)="":FORI=0TO15:READZ$:C
$(0)=C$(0)+CHR$(VAL("&H"+Z$)):NE
XT
190 FOR I=0TO14:C$(I+1)=MID$(C$(
I),2)+LEFT$(C$(I),1):NEXT:A$=USR
0(C$(0))
198 '
199 'PAINT CIRCLES
200 FORI=0TO19:R=8+I*8:C=I AND 1
5:HCIRCLE(160,96),R,1:HPAINT(156
+R,96),C,1:HPAINT(164-R,96),C,1:
NEXT
208 '
209 'PAINT THE LINES BETWEEN THE
 CIRCLES
210 FORI=0TO19:HCIRCLE(160,96),8
+I*8,I AND15:NEXT
218 '
219 'MAIN LOOP - ROTATE PALETTE
AND CHANGE SPEED ACCORDING TO KE
YBOARD INPUT
220 A$=USR0(C$(K)):K=(K-1)AND15
230 FOR X=1TO T
240 A$=INKEY$:IFA$=""THENNEXT:GO
TO220
250 IFA$=CHR$(10)THENT=T*2 ELSEI
FA$="^"THENT=T/2:IFT<1THENT=1
260 GOTO220
268 '
269 'BREAK KEY PRESSED, SO RESET
 PALETTE, SLOW DOWN, AND STOP
270 PALETTE CMP:POKE&HFFD8,0:STO
P
280 '
290 'FOR THOSE OF YOU THAT ARE I
NTERESTED, HERE IS THE SOURCE CO
DE FOR THE USR ROUTINE.  IT IS V
ERY SHORT:
300'
310 'ON ENTRY, X REG. POINTS TO
STRING CONTROL BLOCK.
315 '
320 'PAL16  LDX   2,X      POINT X
TO STRING.
330 '       JMP   $E634  RESET PA
LETTE SLOTS
```

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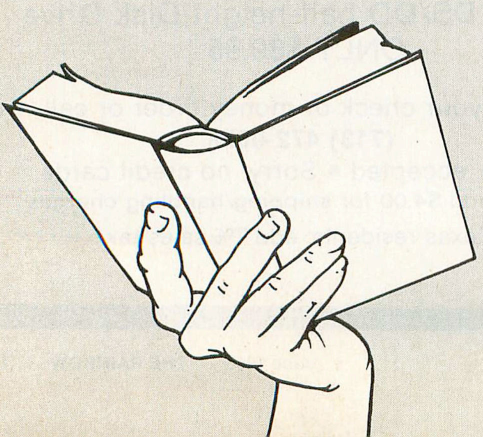

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Database downloading, Part 2

Bringing It on Down!

By Cray Augsburg
Rainbow Technical Editor

All right. We have our terminal software. We know the extensions used for filenames in the CoCo SIG, and we know how the SIG databases are structured. We also have an understanding of the differences between ASCII and binary files. I do believe we are ready to take the plunge and go for a download or two.

For our first download together, let's just pick a program out of the databases. I choose *Intersteller Kamikaze*, which is stored in the Games topic area. So fire up the CoCo, load your terminal program and let's get started.

While this discussion will be generic in terms of overall procedure, the actions performed are those utilized by *MikeyTerm*. This is not to demean the excellent commercially available terminal programs, nor is it intended to detract from any of the other shareware products. Simply put, I prefer to use *MikeyTerm*. I "grew up" with it. It meets my telecommunications needs, and I am comfortable with it. If you use a different program, consult your manual for the necessary information as you follow these procedures. To clarify things a bit, those actions that are *MikeyTerm*-specific will be indicated as such.

To get to the Games database, enter `DATABASE GAME` (or `DA GA` for short) at the CoCo SIG prompt. You should then find yourself at the `DBASES:Gam>` prompt. At this point you can enter `DIR` or simply press `ENTER` to obtain a directory. However, unless Delphi gets hit by lightning or some fiend erases the system storage, you can get to the file by entering `READ INTERSTELLER KAMIKAZE` at the database prompt. The file should be there. Keep in mind, too, that you can shorten the filename in the `READ` command above. Just make sure you enter enough characters to make it unique. `READ INTERST` worked fine for me.

After entering the `READ` command, you should see the following information scroll down your screen:

```
Name: INTERSTELLER KAMIKAZE
Type: PROGRAM
Date: 21-FEB-1988 11:58 by
JBARRETT
Size: 11466 Count: 62
/Entry: 4114  Published by
DONHUTCHISON

INTERSTELLER KAMIKAZE.
Simulation of a star-fighter.
Keep a calculator handy. For
CoCo 1, 2, or 3.

Keywords: SIMULATIONS, GAME,
          SPACE, JOYSTICK

/File: 06$JBARR$INTKAM.BAS Acc:
29-MAR-1988 14:23

ACTION>
```

What you are reading is the group description for the program we are going to download, *Intersteller Kamikaze*. Note the file is 11,466 bytes long. The filename used to store the file is near the bottom, hidden in the line `06$JBARR$INTKAM.BAS`. The number (06) indicates which database the file is "hooked" to. Following that, and separated by dollar signs, are the first five characters of the username of the person who uploaded the file. Finally, the filename is `INTKAM.BAS`. In most cases you will want to use this filename when the time comes to save your program. The extension `.BAS` tells us the file is stored in ASCII format, so we can use Xmodem or the buffer capture protocol to download it.

Finally, you should see the `ACTION>` prompt at the bottom of your screen. This prompt tells you, among other things, that it is now possible to download the file.

Buffer Capture Method

You've entered the proper database and read the description for the file you want to download. You're sitting at the `ACTION>` prompt, and Delphi is waiting for you to decide what to do next. Let's download the file. To initiate a buffer capture download of *Intersteller Kamikaze*, enter `DOWNLOAD` at the `ACTION>` prompt. You will now see the following

Cray Augsburg is RAINBOW's *technical editor and has an associate's degree in electrical engineering. He and his wife, Ruth Ann, have two children and live in Louisville, Kentucky. His username on Delphi is* CRAY.

Database Report

By Don Hutchison
Rainbow CoCo CIG Database Manager

Both RAINBOW SIGs had very active months, both in the forum areas and in the databases. We had a lot of sophisticated, useful software uploaded to us. Let's check out the new material!

OS-9 Online

In the General topic area of the database, **Bill Brady** (WBRADY) uploaded a file called `HELP!`, a collection of his help files for use with the user's group help utility.

In the Programmers Den topic **Mark Griffith** (MARKGRIFF) provided Carl Kreider's C library. Included are the replacement and transcendental math libraries, as well as the archived documents describing the additions to the standard library including the transcendental math functions. Also included is an archived file of all the header files needed to work with the new library functions.

In the Applications topic **Stephen Macri** (DRACMAN) uploaded `CREATE.W1`, a file useful for creating a 640-by-192 four-color window for graphics under Level II. **Bill Brady** (OS9UGED) uploaded some Australian public domain *Sculptor* files. These files include several tricks for menus, etc. Mark Griffith uploaded `MVSKEL.AR`, which contains a skeleton C source file to help new C programmers start writing applications for *Multi-Vue*. The files fully support all *Multi-Vue* utilities such as `Gcal`, `Gclock`, etc., and are written to

Download Method Menu scroll down your screen:

```
Xmodem (128 byte blocks)
Kermit
WXmodem (Windowed Xmodem)
Ymodem (1,024 byte blocks)
Buffer Capture
RT Buffer Capture
YB (Ymodem batch)
```

At this point, it would be wise to make sure the buffer created by your terminal program is empty. To do this with *MikeyTerm*, first go to *MikeyTerm*'s main menu by pressing CONTROL-7. Now press 4 to clear the buffer, Y to acknowledge your request and 1 to return to communications. Pick the buffer capture method by entering `BUFFER` from the download menu. The following will appear on your screen:

```
Ready . . . Press RETURN to
begin:
```

Tell your terminal program to start receiving information into its buffer. With *MikeyTerm* this is done by pressing CONTROL-1, which tells *MikeyTerm* to open its buffer. Once your terminal program is ready to receive information, simply press ENTER. As the file is received by your computer you will see it scroll down your screen. When the transfer is complete, the following message will appear on your screen:

```
>>Download of 218 lines:
Complete.
Your file transfer method
is now Buffer Capture
```

Great! The program has been transferred and you can now save it to tape or disk. We will assume for the purposes of this discussion that you are using a disk system. To do this with *Mikey-*

allow the user to include his own program code. **Bruce Isted** (BRUCEISTED) sent us `XCODES.AR`, a subroutine archive for the `XWord` (`Xed`) editor. Source, binary and documentation files are included. **John Beveridge** (JOHNTORONTO) uploaded `MICRO_EMACS`, a simple text editor. The grouping includes the source code.

In the Utilities topic Bruce Isted uploaded `PARK.AR`, a park utility to replace the Radio Shack park utility. This utility fixes a small bug and adds an "unpark" feature. Bruce also provided two MS-DOS/RS-DOS to OS-9 transfer utilities: `PCDOS.AR` will read or write MS-DOS disks, while `RSDOS.AR` will read or write Disk BASIC disks. (Thanks to Bob Santy for these programs.) **Jim Sanford** (WB4GCS) uploaded a utility to aid in debugging C language programs, as well as documentation and C source for two programs that merge and unmerge files without compression. This allows transfer from MS-DOS to OS-9 and vice versa.

In the Device Drivers topic **Dave Philipsen** (DPHILIPSEN) posted `PRINTER.AR`, an `ARC`ed file with driver and descriptor for the Disto RTIME printer adapter. He included both binary and source files plus a hardware hacker's tip as a bonus.

In the Telecommunications topic Bill Brady sent us `WizCsum`, which computes the checksum for the new version of *WiXmod*, (Xmodem) for the *Wiz*. Bill also uploaded `WIXMOD.CCB`, which is a replacement Xmodem module for the *Wiz*. This version is much faster than the original and fixes a few problems. Users may leave *CoCoBin* enabled all the time on downloads with this version. **Brian Wright** (POLTERGEIST) posted X-Dial, an autodialer designed for use with XCOM9. **Ron Bihler** (RAAB) sent us the `RiBBS` files, an OS-9 BBS system to support all CoCos. `RiBBS` requires the RS-232 pack and at least two disk drives. It provides full Xmodem support and operation up to 2400 baud and is supported under levels I and II.

In the Graphics and Music topic **Mike Knudsen** (RAGTIMER) uploaded *UltiMusE*, a complete graphics editor for creating and editing music scores in standard musical notation and for playing them to any MIDI synthesizer. It includes full documentation and several ready-to-play music files. Three years in the making, *UltiMusE* is quite similar to the popular commercial program *Lyra*. *UltiMusE* requires a CoCo 3 with OS-9 Level II. **Steve Clark** (STEVECLARK) uploaded an updated version of the Macintosh *MacPaint* display and print programs. The display program creates its own window and includes `icon` and `AIF` files for *MultiVue*. **Toni Ryan** (TNTRHODAN) sent us some new fonts for use with *Home Publisher* by Spectral Associates. Toni also included a BASIC09 conversion utility to allow the user to make OS-9 eight-by-eight format fonts into a "publisher" font. **Jason Forbes** (COCO3KID) posted `FEDIT.AR`, a full-featured Level II font editor by Shawn Cokus.

CoCo SIG

In the General topic area, I (DONHUTCHISON) provided an updated file listing the database standards for the CoCo SIG and a current listing of Telenet local access numbers. **Kevin Nickols** (NICKOLS) posted the Tandy Newsletter for March 1988.

In the CoCo 3 Graphics topic, **Bob Wharton** (BOBWHARTON) uploaded his logo of the Boston Celtics in both *MGE* and *CM3* versions. Bob also uploaded Part 3 of his popular *MGE Rocks* series, featuring the logos of various rock groups. **Ron Potter** (RONP) posted a humorous file called `CHIPS.CM3`, inspired by some pictures of the Princeton RAINBOWfest, and a picture of a "Death Star." **Alan DeKok** (ALANDEKOK) uploaded a patch for *CoCo Max 3* that allows using the program with a standard Radio Shack Hi-Res adapter. **George Hoffman** (HOFFBERGER) posted his Pink Floyd album covers. **James MacKenzie** (ZIMBO) uploaded a *Color Max 3* font editor. **Donald Ricketts** (STEVEPDX) uploaded still more of his well-done *CM3* conversions from DS-69 images.

In the Utilities and Applications topic **Dexter Greener** (GDI) uploaded a one-liner BASIC program for examining memory. Bob Wharton uploaded a revision to his program for making labels for disk sleeves. **Michael Schneider** (MSCHNEIDER) uploaded *TC31*, the newest version of the popular archiving program for 512K CoCo 3s. **Paul Dion** (PAULNORMAND) posted his *Quick-E* word processor. **David Mills** (DAVIDMILLS) uploaded a special 128K CoCo 3 utility for copying a disk in only two swaps on a single-drive system and *Pirate's Assassin*, a utility for protecting disk-based programs on all CoCos. David politely included source code and a well-written documentation file, also. **Robert Pierce** (RPIERCE) uploaded a utility for editing a disk's file allocation table. He called it *Fat Editor*, so don't be confused!

In the Hardware Hacking topic I posted a transcript of a forum thread concerning "sparklies" on the CoCo 3. The file is a detailed description of the problem and a cure, which was originally begun by **Roger Krupski** (HARDWAREHACK). **Michael Banks** (KZIN) posted a text file that describes some telecommunications basics for beginners.

In the Games topic **John Barrett** (JBARRETT) uploaded his popular *Mars Voyage* game.

In the Classic Graphics topic **Mark Garbarini** (F19) posted his freehand drawing of an Ingram MAC-10 weapon.

In the Music and Sound topic **Orman Beckles** (ORMAN) posted the theme song from "The Munsters." **Mike Stute** (GRIDBUG) uploaded the song "Love Walks In," and George Hoffman posted a *Lyra* file called `TRFAITH`.

In the Product Reviews and Announcements topic Donald Ricketts uploaded his review of *VIP Writer III* for the CoCo 3.

In the Data Communications topic **Alan Imrie** (ACEOFSWORDS) provided the latest version of *Ultimaterm* Version 4.0 and its associated utilities. I posted a file of miscellaneous customizations for the popular CoCo 3 terminal program *Rickeyterm*. **Joe Josey** (COCOJOE) uploaded a user survey program for use with the *CoBBS* system, and John Barrett provided his interest log program, also for *CoBBS*.

As you can see, the RAINBOW SIGs are always very active. No matter what you're interested in, you'll find it here. Join us online to keep in touch with all the latest!

Term, press CONTROL-7 to return to the menu and choose Option 6, Disk Utility. *MikeyTerm* will ask if you want to read a file into the buffer (Option 1) or write the buffer contents to disk (Option 2.) We want to save the buffer to disk, so press 2. Enter the filename at the next prompt. After checking the disk, *MikeyTerm* will present you with a menu of five different formats in which to save the file. The options are:

```
1) Basic pgm / ASCII
2) Basic pgm / COMPRESSED
3) Machine language pgm
4) ASCII data
5) Binary data
```

Since we know the file is a BASIC program and that it was stored in ASCII format, use Selection 1. Now you can log off Delphi and load the program in BASIC. Chances are you will get a DS (direct statement) Error during the loading. This is normal. Simply resave the file. Now, try to run the program. If the transfer was error-free, you won't have a problem. If line noise interfered with the download, you may have to edit the program before it will run correctly.

Let me remind you, a buffer capture transfer is only useful for files that are stored in ASCII format. To transfer binary files (machine language, tokenized BASIC, etc.), you will need an error-checking protocol such as Xmodem.

Xmodem Method

A terminal program supporting the Xmodem file transfer protocol can be used to download any file whether it is in ASCII or binary format. We have just seen how the process works for a buffer capture download. Let's download the same file using Xmodem.

After reading the group description for *Intersteller Kamikaze*, you should again find the `ACTION>` prompt at the bottom of your screen. While it is possible to initiate the Xmodem download by going through the download menu, we can also do it straight from the prompt. Just enter `XMODEM` or `XM`. Delphi will respond with:

```
Type three consectutive
<Control-C>'s to abort.
OK, receive! (11466 bytes
= 90 XMODEM blocks, text)
```

This message tells you that Delphi is ready to send you a file stored in ASCII format ("text") and that the file is 11466 bytes, or 90 Xmodem blocks, long. To receive the file, tell your terminal program to start an Xmodem download. With *MikeyTerm*, press CONTROL-4. When the transfer is finished, follow the guidelines above to save the file to disk.

Before downloading a program always check the extension, and make sure you know how to save the file once it has been downloaded. Beginners very often save a file as if it were a different format, and they don't understand why it won't work. The mistake is not a serious one, yet it is very confusing and frustrating. And it can be avoided.

Next month we will try to address some of the problems you might encounter in downloading programs from Delphi. In the meantime, try downloading some files. It really is easy once you get the hang of it. If you have a problem, just send Mail or a Forum message to me (CRAY), Don Hutchison (DONHUTCHISON) or Marty Goodman (MARTYGOODMAN). ☐

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DOCTOR Q&A ASCII

By Richard E. Esposito
Rainbow Contributing Editor
with Richard W. Libra

Of Dumps and Degrees

Some time ago, I purchased an Epson RX-80 printer. I do not have drives or CoCo Max, *but I would like to print my Hi-Res designs. How can I do that? Also, when the temperature around Rio was near 40 degrees Celsius, the printer would not print correctly; after it rained and the temperature went down, however, it started to print correctly again. The manual says that the operating temperature is from 5 to 35 degrees C. Could the temperature cause the problem?*

Michael Lees
Rio De Janeiro, Brazil

℞ True Data Products (a RAINBOW advertiser) markets a screen dump program for $19.95 that is claimed to work with Epson printers. Microcomputers and printers (which contain dedicated microprocessors) are temperature-sensitive devices. As you indicated, you were trying to operate your printer at a temperature 5 degrees Celsius above its rating. For years, most computers required special air conditioned environments in order to run at all.

Upgrade Problems

I have VIP Speller, *which works well on my CoCo 2. I recently upgraded to a 512K CoCo 3, and now my spelling checker doesn't work. Does anyone have a fix or a patch for this? Also, I do a lot of my own programming, for myself and others. Can you tell me how I can access all of the full 512K of RAM from BASIC?*

Joel Briere
Lethbridge, Alberta

℞ Most *VIP* software can be fixed for CoCo 3 operation by locating and changing the sequence of bytes from $8C $FF $00 to $8C $FE $00.

Without using OS-9, you can use the extra memory with your existing software as a RAM disk or a print spooler with a software package such as the one supplied with the JramR memory upgrade. RAINBOW advertiser J&R Electronics' software package is available without the hardware for $19.95 for owners of competing CoCo 3 memory upgrades.

Altering Disk BASIC

Can I alter Disk BASIC to support the 6-millisecond stepping rate, two 80-track double-sided drives and a 9600 baud rate? I would like to upgrade my RS-DOS (Disk BASIC) to meet these needs. ADOS does not work on some of my programs. I have found similar programs in HOT CoCo *magazine:* Disk Pokes *(March 1985, Page 90),* 64K Enable *(June 1985, Page 45), and* 80 Track Pokes *program (September 1985, Page 13). Can all these programs be combined to do the job that I want? Another program that I found is* Charger *in RAINBOW (June 1985, Page 113). With this information, can I permanently upgrade my RS-DOS to run under 9600 baud? I do have an EPROM burner and a 68766 EPROM.*

Don Peters
Middletown, OH

℞ You can incorporate just the pokes you mentioned for step rate, 80-track drives and baud rate into a revised Disk BASIC and burn it into an EPROM.

Unnecessary Repair

I have a Korean Model B CoCo 2 and am having a problem. When I set the switch on the back of the computer to Channel 3 and turn it on, all I get is a mess. The screen is black-and-white and pushed over to the right, and I can't read anything on the screen. When I switch to Channel 4 everything works fine. This problem occurred suddenly; the computer used to work on Channel 3 all the time. Is this a problem with the TV set or the computer, or even something I should worry about?

Greg Teets
Cedar Hill, MO

℞ With used CoCo 2s going for under $50 and new CoCo 3s around $100, I'd forego having any repairs made to a CoCo 2 as long as it still runs.

Inadequate Memory

I recently encountered a problem in a DeskMate *program. When I attempted to use Ledger, it worked fine until I finished my formulas and tried to input all the numbers. It was then that I got a "Not enough memory" error. What is the reason for this? I have a CoCo 2 Extended Color BASIC system. I burned an EPROM with ADOS. I also have an FD-501 disk drive, Speech Systems' Super Voice and EARS connected with a triple-Y cable, a DMP-105 Printer and a DCM-3 modem. Could the "Not enough memory" error stem from one of these? Maybe having Super Voice, EARS and my disk drive controller connected at the same time is causing my problem.*

Todd Greene
Star, NC

℞ On a 64K CoCo 2, the OS-9 operating system grabs about half the available memory. The remaining 32K must be shared with the application program and data. Since *DeskMate* runs under OS-9, its memory available

---

Richard Esposito is the principal engineer for BDM Corporation. He holds bachelor's, master's and doctorate degrees from Polytechnic Institute of Brooklyn. He has been writing about microcomputers since 1980.

Richard Libra is a simulator test operator for Singer Link Simulation Systems Division.

for formulas and data is quite limited. As I have preached for years, FLEX was a much better operating system for 64K machines. OS-9 really requires Level II with the additional memory (up to 512K) that is available in the CoCo 3.

Drive Compatibility

I have an ancient, gray-cased CoCo that I want to replace with a CoCo 3 and 512K. With my old Color Computer, I am using two white-cased drives, Cat. No. 26-3029. Drive 0 is s/n 011042. If I install a Version 1.1 chip in the Drive Controller, will these drives be compatible with the new CoCo 3? I realize that there can be power supply problems, and I really need to be sure of the compatibility before I buy.

Charles Burch
Thompson Station, TN

℞ Since the white Radio Shack drives you have were designed to work with the CoCo 2, the controller does not need a 12-volt supply; thus you should not have any problem using them with a CoCo 3. The older gray drives can also be used with the CoCo 3, but a newer 5-volt-only controller is required.

Modifying *Scripsit*

I have an old 'D' Board CoCo 1 that I have self-upgraded to 64K from 16K with Extended Color BASIC. For years I ran a cassette system, but I recently added the FD-501 disk drive. One of the first things I did was to transfer several ROM pack programs to disk, including Scripsit. *Is it possible to get into the program and modify it for saving to and recalling from disk instead of tape? How hard is it, and is it possible to make hardware modifications to alter my FD-501 disk Drive 0 from a single- to a double-sided drive? I also plan soon to purchase a double-sided Drive 1 to fit into the same case.*

Thomas Breaux
Baker, LA

℞ Modifying *Scripsit* to run off disk would be a major task. The program would first need to be relocated out of the way of Disk BASIC (address $C000 +) and the cassette routines replaced with their disk counterparts. Tandy markets a disk version of this program at a modest cost, so the conversion would not be worth the time or effort. It would be much less trouble to purchase a bare double-sided drive than to attempt to retrofit double-sided components into your single-sided drive.

An MMU for the CoCo 3

I understand from looking at the IC Master Volumes there is a Memory-Management Unit or coprocessor that allows the 6809 access up to 2 Meg. Can a satellite board be made to take advantage of the coprocessor and added memory? It would break the 64K barrier of the 6809 working on its own. Also, what is the maximum memory the GIME chip (MMU) can handle? Speaking of GIME chip, what has the upgrade Spectrum offers on that chip done to it? Does Tandy not support an upgrade also?

Alan Parker
Grissom AFB, IN

℞ The CoCo 3 already has a Memory Management unit. The Motorola MMU that you speak of was announced but never put into production. The few samples that were produced switched memory in 4K blocks and were not compatible with the CoCo 3's 8K block scheme. It is possible to augment the CoCo 3's GIME to address 2 Meg; I met someone at the Princeton RAINBOWfest who had done so. With the current OS-9 software base, 512K is more than adequate; installation of additional memory, especially in light of the recent run up in DRAM prices, would not be practical for most users. The new GIME chip with the 'A' suffix can be ordered from Tandy National Parts, but the price is high (about $50). It is purported to cure the "sparklie" problem on the CoCo 3.

MS-DOS Capabilities

I very much appreciate your "telling all" in the January 1988 issue of RAINBOW about the hardware configuration of your system. I have a computer system very similar to yours with the CoCo; like you, I also own a Sharp 7000 MS-DOS portable compatible. I haven't found an MS-DOS program yet that it won't run. Since there is a flood (some have said it is an ocean!) of MS-DOS programs available now, I feel the CoCo needs the capability to access and use MS-DOS records and files directly from MS-DOS disks in programs that are written to run on the CoCo. I have purchased MS-DOS File Manager *from Clearbrook Software Group and the "No Halt" controller from Sardis Technologies, which used the D.P. Johnson* SDISK-3 *program to give the same file reading format to the CoCo 3 running OS-9 Level II that MS-DOS has. I would very much appreciate whatever programming hints you might want to pass on to me about writing programs for the CoCo that have MS-DOS capabilities built into them. Also, is there other hardware for the CoCo that I should consider purchasing in order to give the CoCo MS-DOS accessibility? I feel that better programs can be written for the CoCo than those written for the MS-DOS machines, especially since we have windows, multitasking and multiuser capabilities under OS-9 Level II. Also, I believe that OS-9 Level II conforms more to ANSI and UNIX standards than the OS/2 system that is supposed to be coming for the MS-DOS machines. I think that a program similar to* Excel *that has MS-DOS read and use capability and is written for the 68000 Apple Macintosh computer can be written for the CoCo. It should be an immediate priority to bring into being.*

Donald Adams
Kokomo, IN

℞ I agree with you in principle that most popular PC compatible programs could be ported over to the 512K CoCo 3. Since most of this software is now written in C, porting applications over to the UNIX-like OS-9 is relatively easy. I would especially like to see a *WordPerfect* port, as there is even one for the relatively impotent Apple II. I discussed this with Tandy's Mark Siegel at the Princeton RAINBOWfest and expressed the opinion that if *WordPerfect* ran on the CoCo 3, especially with an MS-DOS file manager, it would be a best-seller.

For a quicker response, your questions may also be submitted through RAINBOW's CoCo SIG on Delphi. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then, at the RAINBOW> prompt, type ASK for "Ask the Experts" to arrive at the EXPERTS> prompt, where you can select the "Doctor ASCII" online form which has complete instructions.

A utility to help you customize your programming language

Changing the Language

By Marc Campbell

I am sure that if you have been computing for any length of time, you have encountered the "novelty program syndrome" — that strange and unpredictable phenomenon wherein an accident, chance occurrence, or just plain luck altered the mediocre project you were working on and transformed it into one of the finest programming achievements you ever developed. *Color Catalyst* is a perfect example of the "novelty program" gone berserk, and all three of the syndrome's criteria were at work on that fateful day when I stumbled into the forbidden outer reaches of Random Access Memory.

Color Catalyst is a menu-driven utility that allows you to change, among other things, the BASIC programming language. You can easily customize any Extended Color BASIC command to suit your liking. For example, you could change `PRINT` to `PT` to save you time at the keyboard. *Color Catalyst* can modify more than just commands; the display, startup messages, error messages, the prompt, the cursor, and even messages like `BREAK`, `ERROR`, and `IN` (as in `BREAK IN 20` or `?SN ERROR IN 35`) are fully supported. With the disk drive and CoCo 3 modifications provided, you can expand *Color Catalyst* as you expand your system. *Color Catalyst* also allows you to save your custom Extended Color BASIC to either disk or tape.

Marc Campbell, a self-taught programmer, is a senior in high school, where he participates in drama and is an editor and award-winning writer for the school newspaper.

As you exit *Color Catalyst*, the computer asks if you want a `RESET` patch. Under normal circumstances, if you press the reset button, the computer will reinitialize, and you'll lose your custom version of BASIC. The `RESET` patch will retain all of your modifications except for the custom display (see the peeks, pokes and execs list for working around this) when you press the reset button; it was adapted from a program written by Thomas Kocourek and Kenneth Rockwell ("Thanks For The Memory," THE RAINBOW, May '87, Page 187, program lines 83 through 87). If you opt not to use this feature, the reset button will operate normally. If you do a cold start (`CLS:EXEC49152` or similar command), the `RESET` patch will be lost.

Using the Program

In order for *Color Catalyst* to work properly, your CoCo must first be in "all-RAM" mode. This simply means that everything the computer stores in ROM (Read-Only Memory, the portion of a computer's memory that cannot be written over) must be copied into RAM (Random Access Memory, memory that both the user and the computer can read and/or revise). A short machine language routine by Joseph Furgione ("Prompt Attention," THE RAINBOW, July '87, Page 97) does the trick quite nicely and is found in Listing 1. On certain machines, you may experience a lock-up when you run Listing 1. If so, precede `POKE65503,0` with `EXEC&HE00`. (If you happen to own a CoCo 3, then you've lucked out again because it is always in all-RAM mode.) Once you have your computer operating in all-RAM mode, you are ready to boot *Color Catalyst*; simply load and

How the Program Works

This line-by-line breakdown supports listings 2 and 4. (The other listings are short enough so that you can see what's going on without a guided tour.)

Line	Function
1	Clears the screen black and checks whether the computer has a disk drive or not. If no disk drive is present, the computer jumps to Line 3
2	Merges the disk modifications with *Color Catalyst* and reruns the composite program
3-5	Define the graphics portion of the title display and put it in `A$`, `B$` and `C$`
6-9	Title screen
10-15	Main menu
16-17	Return to BASIC routine. Line 17 enables the `RESET` patch
18-28	Input/Output menu
29-32	Modify display routine. Line 31 actually changes the display according to the selection made on the menu
33-39	Modify startup messages routine
40-43	Modify prompt routine
44-46	Modify cursor routine. You are asked to input the new cursor character set and flash pattern, both of which are numbers between 0 and 255. Line 46 pokes the new values into memory
47-50	Modify commands routine. After you input the modify command, the computer checks its location in memory. You are then taken to the editor screen
51-55	The new command is poked into memory. The last character in the command is stored as a different ASCII code so the computer can locate the end of the command. If the new command is shorter than the original, the remaining spaces are filled with Character String 2
56-63	Modify error messages routine. This works the same as the

run. (If you are using the disk version, be sure to keep the disk in the drive until you see the title screen.)

Color Catalyst was designed to be a hard-working, user-friendly piece of software. It utilizes a main menu that can access every general feature *Color Catalyst* has to offer: Input/Output Menu, Modify Startup Messages, Modify Display, Modify Prompt, Modify Cursor, Modify Commands, Modify Error Messages, Modify Miscellaneous Messages, and Modify Disk Extensions for disk systems only. When possible, the selection you choose in the main menu will take you to a submenu with more specific options. To select items from a menu, press the up arrow and down arrow keys until the cursor is pointing to the option you want to use. The cursor does a "wrap-around" if it goes past the first or last item on the menu. Press ENTER to select an option or the space bar to return to the main menu. If you are unsure about how to properly select items from the menu, onscreen instructions are present at all times.

Certain selections from the main menu will eventually lead to an editor screen, where modification of Extended Color BASIC usually takes place. At the top of the editor screen, you will see the words Length and Left. Length tells you the number of characters in the item you are modifying; Left tells you the amount of free space remaining in your modification. Use the keyboard to type in the new version of whatever you are modifying. If you make a mistake, you may press the left arrow key to erase one character to the left. (Unfortunately, I was never able to work out a subroutine that enabled movement of the cursor

Peeks, Pokes and Execs

`POKE359,57`	Prepares the computer for a custom display color set. Disables certain ASCII disk operations. `POKE359,126` to restore disk commands
`PEEK(188)`	Returns a 14 if the system has a disk drive or a 6 if not
`PEEK(33021)`	Returns a 50 if the machine is a Color Computer 3
`EXEC44539`	Pauses until you press any key
`CLS:EXEC49152`	Does a cold start; `RESET` patch is lost

Even after you use the `RESET` patch, the custom display will vanish. However, you will be able to restore your custom display by typing `POKE359,57` and the appropriate command below:

`POKE65314,7`	Turns display black on green with a black border
`POKE65314,64`	Turns display black on green with a green border
`POKE65314,32`	Turns display green on black with a black border
`POKE65314,8`	Turns display black on orange with a black border
`POKE65314,72`	Turns display black on orange with an orange border
`POKE65314,40`	Turns display orange on black with a black border

	routine for modifying commands, except the last character is stored normally and any leftover characters are filled with blanks (Character String 0)
64-74	Modify miscellaneous messages routine
75-81	Modify disk extensions routine, usable only with a disk system
82-90	Format the menu screen and cause the cursor (>) to move when the up and down arrow keys are pressed. If the space bar is pressed, the computer jumps back to the main menu. If ENTER is pressed, the computer calculates the number of the selection and returns
91-95	Display contents of the computer's memory. You are then asked if you want to modify what you see through the "window"
96	Initializes the editor screen
97	Displays the current values of `LENGTH` and `LEFT`. The computer waits for a key to be pressed and then stores it in `A$`
98	Checks to see if the down arrow key was pressed. If so, the computer jumps to Line 100. Any key that generates a character code lower than 13 (except the left arrow and BREAK) is disabled
99	Checks to see if the left arrow key was pressed; if so, the computer backspaces one character, if possible
100	Checks to see if any room is left on the editor screen; if not, the computer exits
101	Redraws the cursor and updates the contents of your modification
102	Does a carriage return if the cursor disappears off the right side of the screen
103	Updates the position of the cursor
104	Checks to see if there is any more room in the modification; if not, the computer exits
105-106	Exit editor screen routine
107-112	Poke the modification into memory
113-114	`DATA` lines containing the Color BASIC commands
115	`DATA` line containing the Extended Color BASIC commands
116	`DATA` line containing the Disk Extended Color BASIC commands (disk version only)
117-118	`DATA` lines containing the start addresses of the Color BASIC commands
119	`DATA` line containing the start addresses of the Extended Color BASIC commands
120	`DATA` line containing the start addresses of the Disk Extended Color BASIC commands (disk version only)
121	`DATA` line containing Extended Color BASIC error messages
122	`DATA` line containing Disk Extended Color BASIC error messages (disk version only)
123	`DATA` line containing the start addresses of the Extended Color BASIC error messages
124	`DATA` line containing the start addresses of the Disk Extended Color BASIC error messages (disk version only)
125-127	`DATA` lines containing the values to be poked into memory for the `RESET` patch routine

up, down or right, compensated for carriage returns, and occupied only a small portion of memory. Any ideas out there in RAINBOWland?) Pressing ENTER does a carriage return, and the down arrow allows you to exit the editor screen when you are finished modifying. (The computer automatically exits if you take up more room than is available on the editor screen or if you have no free space left in your modification.)

Variables List

A$	Dummy variable, usually stores an INKEY$ character. In Line 3 it stores the upper graphics characters of the title screen
B$:	Contains the middle graphics characters of the title screen
C$	Contains the lower graphics characters of the title screen
M	Number of commands
N	Number of error messages
S$	Contains spaces (Character String 13), used for formatting menus
S	Start address of whatever you are modifying; also stores the PRINT@ location of the first item on a menu
E	End address of whatever you are modifying; also stores the PRINT@ location of the last item on a menu
Q	Dummy variable sometimes containing the number of the item you selected in a menu
A	Dummy variable used in reading data and the RESET patch
B	Dummy variable used in the RESET patch
W	Dummy variable
F$	Stores the last filename used
C$	Stores the command or error message being modified
W$	Stores the modified command or error message
L	Length of item being modified
Z	Length of custom replacement
P	PRINT@ position of the menu cursor and starting location of cursor in the editor screen
CM	Column position of cursor in editor screen
RW	Row position of cursor in editor screen

Remember that you are toying with a very clean and efficient programming language; it is only logical to assume you will eventually do something that will result in an ugly syntax error. Therefore, several guidelines must be followed when modifying Extended Color BASIC commands for maximum efficiency and a minimum number of SN Errors.

- Do not assign variables with the same name as a command. (If you've changed PRINT to PT, make sure you don't have a variable PT as well.)
- You may disable any Extended Color BASIC command by pressing the down arrow immediately upon entering the editor screen. If you disable a command, don't try to use it in a program.
- Do not have two identical commands.
- Do not use spaces, quotation marks, numbers or carriage returns as part of a command.
- The computer gets confused if you shorten the commands ELSE, FOR and READ.
- If you don't have much experience with *Color Catalyst*, stay clear of single-character commands when at all possible. (Notice how few Extended Color BASIC uses.) Once you have become used to the program, you might try experimenting with them, but be prepared for SN Errors.
- Probably the hardest error to spot is something like this: You've changed FOR to FR and then try to type PRINT FREE(0). (The computer mistakes the FR in FREE as the modified command FOR.) The only solution is to have your wits about you at all times!

As a general rule, you may disregard these guidelines when working with anything else. If you run into any other problems that were excluded from this list, I'd like to hear from you.

Modifications For Your Disk System

Listing 3 contains the modifications required to run the disk version of *Color Catalyst*. Type in Listing 2, save it to disk, erase memory, and type in Listing 3. Save the disk modifications in ASCII format under the filename DISK.BAS. It would be best to keep *Color Catalyst* and the disk modifications on the same disk. If you are using a CoCo 2 that supports true lowercase, you can make the changes shown in Listing 6 to allow this. These changes also correct the display problem during ASCII I/O (discussed later).

Color Catalyst 3

If you own a Color Computer 3, you might want a version of *Color Catalyst* that can customize the features of Super Extended Color BASIC. Listing 4 contains modifications for *Color Catalyst* that will accomplish this. Type in Listing 2, save it to tape or disk, delete lines 7, 12, 15, 29 to 32, 40 to 46, 66, 70 to 73, 114 to 116, 118 to 120, 122 and 124, and then type in Listing 4. It should be noted that *Color Catalyst* and *Color Catalyst 3* are separate programs. You can modify the CoCo 3 enhancements *only* with *Color Catalyst 3*; the cursor, the prompt and the display cannot be customized with this program. As with the original version, disk modifications for *Color Catalyst 3* are found in Listing 5. The disk modifications must be saved in ASCII under the filename DISK.3. Both *Color Catalyst 3* and its disk system modifications work in the same way as their standard Extended Color BASIC counterparts. Finally, the modifications shown in Listing 7 allow support for true lowercase on the CoCo 3 and correct the display problems during ASCII I/O operations.

The Strange Case of T. Harris and T. Earles

If you have a CoCo 3, turn it on (or press the reset button if it is already on) and get into a Hi-Res text screen (either 40-column or 80-column; it doesn't matter). Type CLS100. See that? "T.Harris & T.Earles," says the screen . . . nice touch, huh? Try it again. You now get the standard "Microware Systems Corp." Press the reset button, and you'll be able to see the names again. Those two faces belong to the creators of the GIME chip or of Super Extended Color BASIC. At any rate, *Color Catalyst 3* allows you to modify this message as well. Put your own name there; that'll make the custom BASIC version you designed about as personal and officially "yours" as it's going to get.

Loading Your Modifications From BASIC

Your custom BASIC modifications can be used as a stand-alone machine language program. First of all, insert the tape or disk into the proper device. Type (C)LOADM*"filename"* and press ENTER. When loading is complete, type CLS:EXEC and press ENTER. Welcome to your custom BASIC! If you'd like, you can save the RESET patch (Listing 2, Line 17, starting at `FOR A=`, and lines 125-128) as a separate program and load and run it at this time; make sure you're in all-RAM mode. (If you choose not to load in a RESET patch program, you will lose your custom BASIC modifications if you press the reset button.)

Troubleshooting

With *Color Catalyst*, it is very easy to make a mistake and not realize it until after you think everything is running smoothly. Every attempt was made for you to enjoy an error-free session at the keyboard, but there is no program on the market today that can protect itself completely from human error. Here are several frequent problems you might encounter and their solutions:

- Program crashes aren't fun. If something goes wrong with a program written in your custom version of BASIC, try editing the modifications with *Color Catalyst*.
- If you want to perform any kind of ASCII input or output function (like `CSAVE`*"filename"*`,A` or `MERGE`), first type `POKE359,126`. This will restore some lost I/O functions taken away by *Color Catalyst*, but it will also change the screen back to its normal colors. After the ASCII I/O operations are finished, poke the proper value (as found in the peeks, pokes and execs list) to memory address 65314; the screen will be returned to its custom display mode.
- Programs written in Extended Color BASIC and saved normally will be instantly translated if loaded into a customized system. However, ASCII-saved programs will not be handled in this way and therefore will not run properly.
- Follow the guidelines established previously in this article when modifying commands to avoid those nasty SN Errors.

(Questions or comments regarding these programs may be directed to the author at 266 Riverview Drive, Ephrata, PA 17522. Please enclose an SASE when requesting a reply.) ☐

Editor's note: All of the following listings will be present on RAINBOW ON DISK/TAPE *in "compressed" form. The reader will need to manually resave* `DISK.BAS`, `DISK.3`, `CATALYST.3`, `LCPATCH2` *and* `LCPATCH3` *in ASCII if they are to be used.*

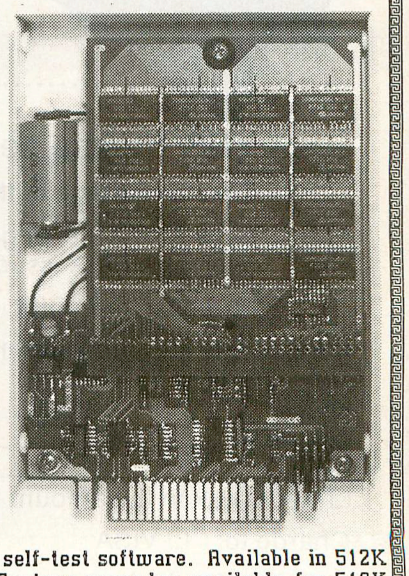
Listing 1: `RAM`

```
1 DATA26,80,142,128,0,127,255,22
2,166,132,127,255,223,167,132,48
,1,140,255,0,38,239,28,159,57
2 FORA=&HE00 TO &HE18:READX:POKE
A,X:NEXT:POKE65503,0
```

6	29	74	113
16	82	86	77
26	100	103	51
37	38	114	77
50	72	119	238
58	138	END	238

Listing 2: `CATALYST`

```
1 CLEAR300:POKE359,126:CLS0:IFPE
EK(188)<>14THEN3
2 PRINT@231,"one"CHR$(128)"momen
t"CHR$(128)"please";:SCREEN0,1:M
ERGE"DISK.BAS",R
3 A$=CHR$(254)+CHR$(252)+CHR$(24
8)+CHR$(245)+CHR$(252)+CHR$(250)
+CHR$(244)+CHR$(255)+CHR$(248)+C
HR$(245)+CHR$(252)+CHR$(250)+CHR
$(245)+CHR$(128)+CHR$(128)+CHR$(
249)+CHR$(128)+CHR$(246)+CHR$(24
5)+CHR$(252)+CHR$(248)+CHR$(244)
+CHR$(255)+CHR$(248)
4 B$=CHR$(250)+CHR$(128)+CHR$(12
8)+CHR$(245)+CHR$(255)+CHR$(250)
+CHR$(128)+CHR$(255)+CHR$(128)+C
HR$(245)+CHR$(255)+CHR$(250)+CHR
$(245)+CHR$(128)+CHR$(128)+CHR$(
128)+CHR$(255)+CHR$(128)+CHR$(24
5)+CHR$(255)+CHR$(250)+CHR$(128)
+CHR$(255)+CHR$(128)
5 C$=CHR$(251)+CHR$(243)+CHR$(24
2)+CHR$(245)+CHR$(128)+CHR$(250)
```



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```
+CHR$(128)+CHR$(255)+CHR$(128)+C
HR$(245)+CHR$(128)+CHR$(250)+CHR
$(245)+CHR$(243)+CHR$(242)+CHR$(
128)+CHR$(255)+CHR$(128)+CHR$(24
1)+CHR$(243)+CHR$(250)+CHR$(128)
+CHR$(255)+CHR$(128)
6 POKE359,57:POKE65314,40:M=113:
N=25:PRINT@13,"COLOR":PRINT@36,A
$:PRINT@68,B$:PRINT@100,C$
7 'DISK LINE HERE
8 PRINT@166,"CUSTOM BASIC UTILIT
Y":PRINT@232,"BY MARC CAMPBELL":
PRINT@489,"[C] MCMLXXXVII";
9 EXEC44539:POKE65314,7
10 CLS:X=1:PRINT"********** MAIN
 MENU ***********":S$="    ":GOS
UB82:X=0
11 PRINTS$"INPUT/OUTPUT MENU",S$
"MODIFY STARTUP MESSAGES",S$"MOD
IFY DISPLAY",S$"MODIFY PROMPT",S
$"MODIFY CURSOR",S$"MODIFY COMMA
NDS",S$"MODIFY ERROR MESSAGES",S
$"MODIFY MISC. MESSAGES":S=163:E
=419
12 'DISK LINE HERE
13 PRINTS$"RETURN TO BASIC":GOSU
B83
14 IFQ=1THEN18ELSEIFQ=2THEN33ELS
EIFQ=3THEN29ELSEIFQ=4THEN40ELSEI
FQ=5THEN44ELSEIFQ=6THEN47ELSEIFQ
=7THEN56ELSEIFQ=8THEN64
15 'DISK LINE HERE
16 CLS:PRINT"DO YOU WANT TO EXIT
? (Y/N)":EXEC44539:A$=INKEY$:IFA
$="N"THEN10ELSEPRINT"DO YOU WANT
 A RESET PATCH? (Y/N)":EXEC44539
:A$=INKEY$:IFA$="N"THENCLS:NEW
17 RESTORE:FORQ=1TO(M*2)+(N*2):R
EADA$:NEXT:FORA=12288TO12354:REA
DB:POKEA,B:NEXT:EXEC12288:CLS:NE
W
18 CLS:PRINT"******* INPUT/OUTPU
T MENU ******"
19 GOSUB82:PRINTS$"LIST BASIC CO
MMANDS",S$"LIST BASIC ERROR MESS
AGES",S$"SAVE CUSTOM BASIC TO TA
PE",S$"LOAD CUSTOM BASIC FROM TA
PE":S=163:E=259
20 'DISK LINE HERE
21 GOSUB83
22 W=0:PRINT@406,"":IFQ=1THENCLS
:RESTORE:FORQ=1TO M:READA$:PRINT
A$,:W=W+1:IFW=30THENEXEC44539:CL
S:W=0:NEXTELSENEXT:EXEC44539:GOT
O10
23 IFQ=2THENCLS:RESTORE:FORQ=1TO
 M*2:READA$:NEXT:FORQ=1TO N:READ
A$:PRINTA$,:W=W+1:IFW=30THENEXEC
44539:CLS:W=0:NEXTELSENEXT:EXEC4
4539:GOTO10
```

```
24 IFQ=3THENINPUT" WHAT IS THE F
ILENAME";F$:F$=LEFT$(F$,8):CSAVE
MF$,33000,54168,49152:GOTO10
25 IFQ=4THENINPUT" WHAT IS THE F
ILENAME";F$:F$=LEFT$(F$,8):CLOAD
MF$:GOTO10
26 IFQ=5THENINPUT" WHAT IS THE F
ILENAME";F$:F$=LEFT$(F$,8):SAVEM
F$,33000,54168,49152:GOTO10
27 IFQ=6THENINPUT" WHAT IS THE F
ILENAME";F$:F$=LEFT$(F$,8):LOADM
F$:GOTO10
28 IFQ=7THENCLS:DIR:PRINT"FREE:"
FREE(0):EXEC44539:GOTO10
29 CLS:PRINT"******** MODIFY DIS
PLAY ********"
30 GOSUB82:PRINTS$"BLACK / GREEN
 / BLACK",S$"BLACK / GREEN / GRE
EN",S$"GREEN / BLACK / BLACK",S$
"BLACK / ORANGE / BLACK",S$"BLAC
K / ORANGE / ORANGE",S$"ORANGE /
 BLACK / BLACK":S=163:E=323:GOSU
B83
31 IFQ=1THENPOKE65314,7ELSEIFQ=2
THENPOKE65314,64ELSEIFQ=3THENPOK
E65314,32ELSEIFQ=4THENPOKE65314,
8ELSEIFQ=5THENPOKE65314,72ELSEIF
Q=6THENPOKE65314,40
32 GOTO10
33 CLS:PRINT"**** MODIFY STARTUP
 MESSAGE ****"
34 GOSUB82:PRINTS$"EXTENDED COLO
R BASIC":S=163:E=163
35 'DISK LINE HERE
36 GOSUB83
37 IFQ=1THENS=33000:E=33080
38 IFQ=2THENS=49465:E=49550
39 GOSUB91:GOSUB107:GOTO10
40 CLS:PRINT@194,"WHICH PROMPT?
 (1) OK  (2) ?":EXEC44539:A$=INK
EY$:IFA$="1"THENS=44014:E=44015E
LSES=47536:E=47536
41 GOSUB91
42 GOSUB107
43 GOTO10
44 CLS:PRINT"******** MODIFY CUR
SOR *********":PRINT"OLD CURSOR
CHARACTER SET:"PEEK(41384):PRINT
"OLD CURSOR FLASH PATTERN:"PEEK(
41382):PRINT:PRINT"INPUT THE NEW
 CHARACTER SET AND FLASH PATTERN
."
45 INPUTQ,W:IFQ>255 OR W>255 OR
Q<0 OR W<0 THENSOUND1,1:GOTO45EL
SE PRINT:PRINT"NEW CURSOR CHARAC
TER SET:"Q:PRINT"NEW CURSOR FLAS
H PATTERN:"W:PRINT:PRINT"IS THIS
 MODIFICATION O.K.? (Y/N)":EXEC4
4539:A$=INKEY$:IFA$="N"THEN44
46 POKE41384,Q:POKE41382,W:GOTO1
```

```
0
47 RESTORE:CLS:PRINT"******** MO
DIFY COMMANDS *******":PRINT"INP
UT THE BASIC COMMAND YOU WISHTO
MODIFY."
48 INPUTC$:FORQ=1TO M:READA$:IFA
$=C$THEN49ELSENEXT:SOUND1,1:REST
ORE:GOTO48
49 RESTORE:FORW=1TO M:READQ$:NEX
T
50 FORW=M TO M+Q-1:READA:NEXT:S=
A:E=S+(LEN(C$)-1):GOSUB91
51 RESTORE:IFZ=0THENW$=CHR$(2):Z
=1
52 IFZ=1ANDC$<>"?"THENPOKES,ASC(
W$)-64+192ELSEIFZ=1ANDC$="?"THEN
POKES,ASC(W$)
53 IFZ>1THENFORQ=S TO LEN(W$)+S-
2:POKEQ,ASC(MID$(W$,Q+1-S,1)):NE
XT:POKEQ,ASC(MID$(W$,Q+1-S,1))-6
4+192
54 IFZ=L THEN55ELSEFORQ=LEN(W$)+
S TO E:POKEQ,2:NEXT
55 PRINT@491,"MORE? (Y/N)";:EXEC
44539:A$=INKEY$:IFA$="Y"THEN47EL
SE10
56 RESTORE:CLS:PRINT"**** MODIFY
 ERROR MESSAGES *****":PRINT"INP
UT THE ERROR MESSAGE YOU WISHTO
MODIFY."
57 INPUTC$:FORQ=1TO M*2:READA$:N
EXT:Q=Q-1:FORW=Q TO Q+N:READA$:I
FA$=C$THEN58ELSENEXT:RESTORE:SOU
ND1,1:GOTO57
58 RESTORE:FORQ=1TO (M*2)+N:READ
A$:NEXT
59 FORQ=(M*2)+N TO W+N:READA:NEX
T:S=A:E=S+1:GOSUB91
60 RESTORE:IFZ=0THENFORQ=S TO S+
1:POKEQ,0:NEXT
61 IFZ=1THENPOKES,ASC(W$):POKES+
1,0
62 IFZ=2THENFORQ=S TO S+1:POKEQ,
ASC(MID$(W$,Q+1-S,1)):NEXT
63 PRINT@491,"MORE? (Y/N)";:EXEC
44539:A$=INKEY$:IFA$="Y"THEN56EL
SE10
64 CLS:PRINT"***** MODIFY MISC.
MESSAGES ****"
65 GOSUB82:PRINTS$"MODIFY '?REDO
'",S$"MODIFY '?EXTRA IGNORED'",S
$"MODIFY 'MICROSOFT'",S$"MODIFY
'ERROR'",S$"MODIFY 'BREAK'",S$"M
ODIFY 'IN'",,S$"MODIFY +/- SIGNS
":S=163:E=355
66 'DISK LINE HERE
67 GOSUB83
68 IFQ=1THENS=45007:E=45011
69 IFQ=2THENS=45288:E=45301
70 IFQ=3THENS=41318:E=41326
```

```
71 IFQ=4THENS=44002:E=44006
72 IFQ=5THENS=44019:E=44023
73 IFQ=6THENS=44009:E=44010ELSEI
FQ=8THENS=54111:E=54123ELSEIFQ=9
THENS=54124:E=54141ELSEIFQ=10THE
NS=54142:E=54168ELSEIFQ=7THENCLS
:PRINT@226,"+ (POSITIVE) OR - (N
EGATIVE)?":EXEC44539:A$=INKEY$:I
FA$="+"THENS=48605:E=48605ELSES=
48611:E=48611
74 GOSUB91:GOSUB107:PRINT@491,"M
ORE? (Y/N)";:EXEC44539:A$=INKEY$
:IFA$="Y"THEN64ELSE10
75 CLS:PRINT"**** MODIFY DISK EX
TENSIONS ****"
76 GOSUB82:PRINTS$"BASIC EXTENSI
ON (BAS)",S$"DATA EXTENSION (DAT
)",S$"BINARY EXTENSION (BIN)",S$
"NO EXTENSION (   )":S=163:E=259
:GOSUB83
77 IFQ=1THENS=49830:E=49832
78 IFQ=2THENS=49836:E=49838
79 IFQ=3THENS=49839:E=49841
80 IFQ=4THENS=49833:E=49835
81 GOSUB91:GOSUB107:GOTO10
82 PRINT"POSITION THE CURSOR AT
YOUR SEL-ECTION AND PRESS <ENTER
>.":PRINT:IFX<>1THENPRINT@481,"P
RESS THE SPACE BAR TO RETURN.";:
PRINT@128,"":RETURNELSERETURN
83 P=S
84 PRINT@P,">";
85 EXEC44539:A$=INKEY$:IFA$="^"T
HENPRINT@P," ";:P=P-32:IFP<S THE
NP=E
86 IFA$=CHR$(10)THENPRINT@P," ";
:P=P+32:IFP>E THENP=S
87 IFA$=CHR$(13)THEN90
88 IFA$=" "THEN10
89 GOTO84
90 Q=((P-3)/32):Q=Q-((S-3)/32)+1
:RETURN
91 CLS:PRINT"      THE COMPUTER'S
 MEMORY"::PRINTSTRING$(32,"*");:
FORQ=S TO E
92 PRINTCHR$(PEEK(Q));
93 NEXT
94 PRINT:PRINTSTRING$(32,"*");:L
=E-S+1
95 CM=0:W$="":Z=0:P=32:RW=0:PRIN
T" DO YOU WANT TO MODIFY? (Y/N)
":EXEC44539:A$=INKEY$:IFA$="N"TH
EN10ELSECLS
96 CM=POS(0)+(RW*32):PRINT@P+CM,
CHR$(207);
97 PRINT@0,"LENGTH:"L,"LEFT:"L-Z
:EXEC44539:A$=INKEY$
98 IFA$=CHR$(10)THEN105ELSEIFASC
(A$)<13ANDASC(A$)<>8THEN97
99 IFA$<>CHR$(8)THEN100ELSEIFZ>0
```

```
ANDCM/32-RW+1<>1 THENZ=Z-1:W$=LE
FT$(W$,Z):PRINT@P+CM," ";:PRINT@
P+CM,A$;:GOTO103ELSESOUND1,1:GOT
O97
100 IFP+CM>479THEN105
101 PRINT@P+CM+1,CHR$(207);:PRIN
T@P+CM,A$;:Z=Z+1:W$=W$+A$
102 IFPOS(0)=0THENRW=RW+1
103 CM=POS(0)+(RW*32):IFA$=CHR$(
8)ORA$=CHR$(13)THENPRINT@P+CM,CH
R$(207);
104 IFZ=L THEN105ELSE97
105 PRINT@P+CM," ";:SOUND1,1:PRI
NT@0,"IS THIS MODIFICATION O.K.?
 (Y/N)";:EXEC44539:A$=INKEY$:IFA
$="N"THEN91
106 RETURN
107 IFZ=0THEN110ELSEFORQ=S TO LE
N(W$)+S-1
108 POKEQ,ASC(MID$(W$,Q+1-S,1))
109 NEXT:IFZ=L THENRETURN
110 FORQ=LEN(W$)+S TO E
111 POKEQ,0
112 NEXT:RETURN
113 DATAFOR,GO,REM,',ELSE,IF,DAT
A,PRINT,ON,INPUT,END,NEXT,DIM,RE
AD,RUN,RESTORE,RETURN,STOP,POKE,
CONT,LIST,CLEAR,NEW,CLOAD,CSAVE,
OPEN,CLOSE,LLIST,SET,RESET,CLS,M
OTOR,SOUND,AUDIO,EXEC,SKIPF,TAB(
,TO,SUB,THEN,NOT,STEP,OFF,+,-,*,
/,^,AND,OR,>,=,<,SGN,INT
114 DATAABS,USR,RND,SIN,PEEK,LEN
,STR$,VAL,ASC,CHR$,EOF,JOYSTK,LE
FT$,RIGHT$,MID$,POINT,INKEY$,MEM
,?
115 DATADEL,EDIT,TRON,TROFF,DEF,
LET,LINE,PCLS,PSET,PRESET,SCREEN
,PCLEAR,COLOR,CIRCLE,PAINT,GET,P
UT,DRAW,PCOPY,PMODE,PLAY,DLOAD,R
ENUM,FN,USING,ATN,COS,TAN,EXP,FI
X,LOG,POS,SQR,HEX$,VARPTR,INSTR,
TIMER,PPOINT,STRING$
116 'DISK LINE HERE
117 DATA43622,43625,43627,43630,
43631,43635,43637,43641,43646,43
648,43653,43656,43660,43663,4366
7,43670,43677,43683,43687,43691,
43695,43699,43704,43707,43712,43
717,43721,43726,43731,43734,4373
9,43742,43747,43752,43757,43761,
43766,43770,43772,43775
118 DATA43779,43782,43786,43789,
43790,43791,43792,43793,43794,43
797,43799,43800,43801,43802,4380
5,43808,43811,43814,43817,43820,
```

1988 -- The Year of the Hard Disk!

The CoCo XT hard disk interface from **Burke & Burke** lets you connect up to 2 low cost, PC compatible 5-120 Megabyte capacity hard drives to your CoCo. You buy the drive, Western Digital WD1002-WX1 or WD1002-27X (RLL) controller, and a case from the PC dealer of your choice. Just plug them into the CoCo XT, plug the CoCo XT into your Multi-PAK, and you have a 20 Meg OS9 hard disk system for **under $450!**

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```
43824,43827,43831,43834,43837,43
841,43844,43850,43855,43861,4386
5,43870,43876,47212
119 DATA33155,33158,33162,33166,
33171,33174,33177,33181,33185,33
189,33195,33201,33207,33212,3321
8,33223,33226,33229,33233,33238,
33243,33247,33252,33257,33259,33
310,33313,33316,33319,33322,3332
5,33328,33331,33334,33338,33344,
33349,33354,33360
120 'DISK LINE HERE
121 DATANF,SN,RG,OD,FC,OV,OM,UL,
BS,DD,/0,ID,TM,OS,LS,ST,CN,FD,AO
,DN,IO,FM,NO,IE,DS
122 'DISK LINE HERE
123 DATA43951,43953,43955,43957,
43959,43961,43963,43965,43967,43
969,43971,43973,43975,43977,4397
9,43981,43983,43985,43987,43989,
43991,43993,43995,43997,43999
124 'DISK LINE HERE
125 DATA52,23,142,127,249,134,12
6,167,4,220,114,237,5,134,183,16
7,1,204,255,223
126 DATA237,2,134,18,167,0,159,1
14,48,30,159,35,159,39,204,159,1
14,190,192,0
127 DATA140,68,75,38,5,142,192,0
,32,3,142,128,0,48,1,16,63,132,3
8,249
128 DATA204,18,18,237,132,53,151
```

Listing 3: DISK.BAS

```
2 'COLOR CATALYST DISK VERSION
7 M=139:N=36
12 PRINTS$"MODIFY DISK EXTENSION
S":E=451
15 IFQ=9THEN75
20 PRINTS$"SAVE CUSTOM BASIC TO
DISK",S$"LOAD CUSTOM BASIC FROM
DISK",S$"DISK DIRECTORY":E=355
35 PRINTS$"DISK EXTENDED BASIC 1
.1":E=195
66 PRINTS$"MODIFY 'INSERT SOURCE
'",S$"MODIFY 'INSERT DESTINATION
'",S$"MODIFY 'AND PRESS ENTER'":
E=451
116 DATADIR,DRIVE,FIELD,FILES,KI
LL,LOAD,LSET,MERGE,RENAME,RSET,S
AVE,WRITE,VERIFY,UNLOAD,DSKINI,B
ACKUP,COPY,DSKI$,DSKO$,DOS,CVN,F
REE,LOC,LOF,MKN$,AS
120 DATA49554,49557,49562,49567,
49572,49576,49580,49584,49589,49
595,49599,49603,49608,49614,4962
0,49626,49632,49636,49641,49646,
49689,49692,49696,49699,49702,49
706
122 DATABR,DF,OB,WP,FN,FS,AE,FO,
SE,VF,ER
124 DATA49808,49810,49812,49814,
49816,49818,49820,49822,49824,49
826,49828
```

Listing 4: CATLYST3

```
1 CLEAR300:ONBRKGOTO10:POKE359,1
26:IFPEEK(33021)<>50THENCLS:PRIN
T@192,"COLOR CATALYST 3 WILL NOT
 RUN ONA STANDARD COLOR COMPUTER
 1 OR 2":EXEC44539:CLS:ENDELSECL
S0:IFPEEK(188)<>14THEN3
2 PRINT@231,"one"CHR$(128)"momen
t"CHR$(128)"please";:SCREEN0,1:M
ERGE"DISK.3",R
6 POKE359,57:POKE65314,40:M=28:N
=2:PRINT@13,"COLOR":PRINT@36,A$:
PRINT@68,B$:PRINT@100,C$:PRINT@1
43,"3"
9 EXEC44539:POKE65314,7:POKE359,
126
11 PRINTS$"INPUT/OUTPUT MENU",S$
"MODIFY STARTUP MESSAGES",S$"MOD
IFY COMMANDS",S$"MODIDFY ERROR M
ESSAGES",S$"MODIFY MISC. MESSAGE
S":S=163:E=323
14 IFQ=1THEN18ELSEIFQ=2THEN33ELS
EIFQ=3THEN47ELSEIFQ=4THEN56ELSEI
FQ=5THEN64
24 IFQ=3THENINPUT" WHAT IS THE F
ILENAME";F$:F$=LEFT$(F$,8):CSAVE
MF$,57797,63278,49152
26 IFQ=5THENINPUT" WHAT IS THE F
ILENAME";F$:F$=LEFT$(F$,8):SAVEM
F$,57797,63278,49152
38 IFQ=2THENS=58019:E=58130ELSEI
FQ=3THENS=58134:E=58245
65 GOSUB82:PRINTS$"MODIFY 'MICRO
WARE SYSTEMS'",S$"MODIFY 'HARRIS
 & EARLES'":S=163:E=195
68 IFQ=1THENS=63234:E=63256
69 IFQ=2THENS=63259:E=63277
113 DATAWIDTH,PALETTE,HSCREEN,LP
OKE,HCLS,HCOLOR,HPAINT,HCIRCLE,H
LINE,HGET,HPUT,HBUFF,HPRINT,ERR,
BRK,LOCATE,HSTAT,HSET,HRESET,HDR
AW,CMP,RGB,ATTR,LPEEK,BUTTON,HPO
INT,ERNO,ERLIN
117 DATA57797,57802,57809,57816,
57821,57825,57831,57837,57844,57
849,57853,57857,57862,57868,5787
1,57874,57880,57885,57889,57895,
57900,57903,57906,57956,57961,57
967,57973,57977
121 DATAHR,HP
123 DATA58572,58574
```

Listing 5: DISK.3

```
2 'COLOR CATALYST 3 DISK VERSION
20 PRINTS$"SAVE CUSTOM BASIC TO
DISK",S$"LOAD CUSTOM BASIC FROM
DISK",S$"DISK DIRECTORY":E=355
35 PRINTS$"DISK EXTENDED BASIC 2
.0",S$"DISK EXTENDED BASIC 2.1":
E=227
```

Listing 6: LCPATCH2

```
1 CLEAR300:POKE&H95C9,&HFF:CLS0:
IFPEEK(188)<>14THEN3
2 POKE65314,40:PRINT@231,"ONE MO
MENT PLEASE";:SCREEN0,1:MERGE"DI
SK.BAS",R
6 POKE65314,40:M=112:N=25:PRINT@
13,"COLOR":PRINT@36,A$:PRINT@68,
B$:PRINT@100,C$
31 GOSUB129:IFQ=1THENPOKE65314,0
ELSEIFQ=2THENPOKE65314,64ELSEIFQ
=3THENPOKE65314,32ELSEIFQ=4THENP
OKE65314,8ELSEIFQ=5THENPOKE65314
,72ELSEIFQ=6THENPOKE65314,40
129 PRINT@384,"1) ALL CAPS  2) U
PPER/LOWERCASE";:EXEC44539:A$=IN
KEY$:IFA$="1"THENRETURNELSEIFA$=
"2"THEN130ELSE129
130 IFQ=1THENPOKE65314,16ELSEIFQ
=2THENPOKE65314,80ELSEIFQ=3THENP
OKE65314,48ELSEIFQ=4THENPOKE6531
4,24ELSEIFQ=5THENPOKE65314,88ELS
EIFQ=6THENPOKE65314,56
131 GOTO32
```

Listing 7: LCPATCH3

```
1 CLEAR300:ONBRKGOTO10:POKE&H95C
9,&HFF:IFPEEK(33021)<>50THENCLS:
PRINT@192,"COLOR CATALYST 3 WILL
 NOT RUN ONA STANDARD COLOR COMP
UTER 1 OR 2":EXEC44539:CLS:ENDEL
SECLS0:IFPEEK(188)<>14THEN3
2 POKE65314,40:PRINT@231,"ONE MO
MENT PLEASE";:SCREEN0,1:MERGE"DI
SK.3",R
6 POKE65314,40:M=28:N=2:PRINT@13
,"COLOR":PRINT@36,A$:PRINT@68,B$
:PRINT@100,C$:PRINT@143,"3"
```

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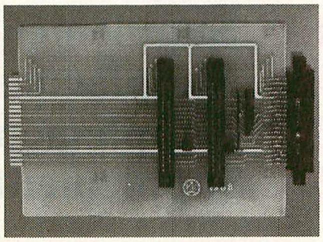

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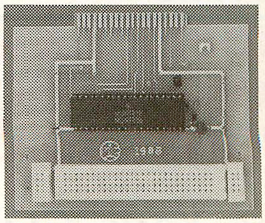

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KISSable OS-9

Another Great Beginning

By Dale L. Puckett
Rainbow Contributing Editor

Things continue to get better in the OS-9 world. Since I hadn't checked into the OS-9 SIG on CompuServe for several months, I logged on this weekend and looked around. Moving to the DL 10 data library, which is packed full of Color Computer OS-9 programs, I asked for a description of all the files that had been uploaded in the last 60 days. Much to my surprise, I wound up staring at nine pages of 9-point type describing 65 programs. The SysOps have received more than one program a day from their members.

To a large degree, this new breath of excitement and productivity in the Color Computer OS-9 world has been caused by the release of *Multi-Vue*. This visual interface has started to excite software developers and end users alike. If all goes well, *Multi-Vue* will be the first step on a path to prosperity for both, as the increased productivity made possible by a consistent and intuitive user interface opens the gate to thousands of new OS-9 users. We start another great adventure this month with the first installment of a "shell," or skeleton program, which you can use each time you write a BASIC09 application for *Multi-Vue*. But first . . .

OS-9 PASCAL at Its Best

We're holding the dialogue short this month because we have a lot of code for you. John Lind, KD7XG, came through with a PASCAL program that calculates the radio frequencies you can use to reach any point on earth at a particular time. First, it computes the propagation values for the area you request for each day of the month. Then it draws a chart that gives you a graphic representation of the data.

Lind originally wrote the calculation part of the program in BASIC09. He reports that the compiled PASCAL code runs three to four times faster. He also found that the PASCAL code here performs much faster than a C version he experimented with.

When you get ready to compile the assembler output of your OS-9 `Pcode` translator, you'll need to use the OS-9 Level I assembler. The translator code is not compatible with `RMA`, the macro assembler that comes with the OS-9 Level II development package.

Listing 1: `MVShell`

```
PROCEDURE MVShell
 0000       (* MVShell -- The beginning of an adventure in Multi-Vue
 0038       (*
 003B       (* You'll need this code in each Basic09 Application program
 0077       (* you write for Multi-Vue.
 0092       (*
 0095       (* This month we show you how to create Basic09 Type statements
 00D4       (* that emulate the C header files presented in the Multi-Vue
 0111       (* documentation and supplied as part of the Tandy Program
 014B       (* Developers package.  We tacked on a quick SysCall routine
 0187       (* at the end that will let you see that your definitions
 01C1       (* actually work.  We'll add the File, Edit and other menus
 01FC       (* soon and show you how to add your own.  We'll also be showing
 023C       (* you how to set up a mouse routine that runs in the background
 027C       (* and sends signals to your application when the user clicks the
 02BD       (* mouse button.  When we finish this "Shell" or "skeleton"
 02F8       (* application, all you'll need will be your own application
 0335       (* code.
 033D       (*
 0340       (* First, we must define the variables we will use in every
 037B       (* Multi-Vue based program.  These definitions use the same
 03B6       (* names as the C header files that come with the Developers
 03F3       (* Pak.  Our first group of definitions is an emulation of the
 0432       (* Wind.H file.
 0441
 0442       (* General definitions
 0458       DIM Null,StdIn,CallCode,FunCode:BYTE
 046B       DIM StdOut:INTEGER
 0472       DIM EndStr:STRING[1]
 047E       Null:=0
 0485       EndStr:=CHR$(Null)
 048E       StdOut:=1 \StdIn:=0
 049C
 049D
 049E       (* Define 6809 registers so we can use the get
 04CC       (* and set status calls with syscall
 04F0
 04F1       TYPE Registers=cc,a,b,dp:BYTE; x,y,u:INTEGER
```

Dale L. Puckett, a freelance writer and programmer, serves as director-at-large of the OS-9 Users Group and is a member of the Computer Press Association. His username on Delphi is DALEP*: on packet-radio,* K0HYD *@* N4QQ*; on GEnie, D.PUCKET2; and on CIS, 71446,736.*

```
0516        DIM Regs:Registers
051F
0520        (* Window type defs.  They tell the WindInt code within OS-9
055C        (* what type of box you want to create on the screen.
0591        DIM WT_NBox,WT_FWin,WT_FSWin,WT_SBox,WT_DBox,WT_PBpox:INTEGER
05AC        WT_NBox:=0 \WT_FWin:=1 \WT_FSWin:=2
05C1        WT_SBox:=3 \WT_DBox:=4 \WT_PBox:=5
05D7
05D8        DIM MNEnbl,MNDsbl:BYTE \(* MV talk for Enable and MNDsbl
0603        MNEnbl:=1 \MNDsbl:=Null
0612
0613        DIM WINSync:INTEGER
061A        WINSync:=$C0C0
0622
0623        DIM MN_Move,MN_Clos,MN_Grow,MN_Uscrl,MN_Dscrl,MN_Rscrl,MN_Lscrl

             :BYTE
0642        DIM MN_Tndy,MN_File,MN_Edit,MN_Styl,MN_Font:BYTE
0659        MN_Move:=1 \MN_Clos:=2 \MN_Grow:=3 \MN_Uscrl:=4
0675        MN_Dscrl:=5 \MN_Rscrl:=6 \MN_Lscrl:=7
068A        MN_Tndy:=20 \MN_File:=21 \MN_Edit:=22
069F        MN_Styl:=23 \MN_Font:=24
06AD
06AE        (* Window menu data structures
06CC        (* The first structure holds a menu item descriptor which includes:
070F        (* the name of the item, a byte to tell if the item is enabled or not,
0755        (* and five reserved bytes.
0770
0771        TYPE Mistr=_mnttl:STRING[15]; _mienbl:BYTE; _mires(5):BYTE
0792        DIM MidScr:Mistr
079B
079C        (* The next structure holds the definition of a menu.  This includes:
07E1        (* The name of the menu, the id number of the menu, the width of the
0825        (* menu, the number of items in the menu and a byte that tells
0864        (* if the item is available or not.  Two "reserved" bytes must be
08A5        (* inserted before the last field.  Make this correction in your
08E5        (* Multi-Vue manual.
08F9        (* The final item in the structure is a pointer to the address of the
093E        (* array of structures that hold the individual menu items.
0979
097A        TYPE mnstr=_mittl:STRING[15]; _mnid,_mnxsiz,_mnnits,_mnenabl

             :BYTE; _reser2,_mnitems:INTEGER
09A6        DIM MNDscr:mnstr
```

The files `Skipmuf_dat` and `Config_muf` must be present in your current data directory when you run `Skipmuf`. `Skipmuf_dat` contains data the program needs to compute propagation conditions for many of the locations in the world that interest amateur radio operators and short wave listeners. `Config_muf` data is personalized for my home QTH — that's ham radio speak for location — in Rockville, Maryland. You can edit it with your favorite text editor to set up the program for your location. In fact, you can also use an editor to add other locations in the world to `Skipmuf_dat`.

When you start the program you will be asked to pick the area of the world for which you want the propagation prediction. After you select a location, you will be asked for the "Zurich smoothed sunspot number" or the "solar flux index." The flux index is broadcast every hour, 17 minutes after the hour, on WWV and WWVH. You'll find these National Bureau of Standards stations on exactly 5, 10 and 15 MHz, 24 hours a day. You can find the sunspot number in the monthly "How's DX" column in *QST* magazine. However, the flux index method is more

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since the sunspot data must be d and averaged several months time for publication.

n to watch this program run, but the main reason we wanted to share it with you is its tremendous tutorial value. It demonstrates clearly how to create device windows and draw images on them using OS-9 PASCAL. Look over the columns in which we featured KISSdraw and compare the BASIC09 drawing techniques to those used in PASCAL.

> ***"To a large degree, this new breath of excitement and productivity has been caused by the release of* Multi-Vue.*"***

Lind sends out the code using PASCAL `Write` statements. He did not create special data types for drawing and "put" them on the screen like we did in `KISSDrawPut` in the January column, but you will notice that because of the similarity between BASIC09 and PASCAL, it would be very easy to do this. John considers `Skipmuf` "freeware" and hopes it will help you hear or "work the world." We'll be sending a copy of this program to the OS-9 Users Group librarian, Carl Kreider. We're also sending a detailed documentation file to Kreider and to the RAINBOW ON DISK editor, so disk subscribers and RAINBOW's Delphi OS-9 OnLine SIG members can pick up additional facts about propagation calculations that simply will not fit in the magazine. In fact, we had to split `Skipmuf` into three installments.

The Road to *Multi-Vue*

One of the outstanding files I noticed while surveying the OS-9 SIG data library was `MVSKEL.AR`. Mark D. Griffith has put together what he calls a skeleton file. It will move C programmers into the *Multi-Vue* world painlessly. A seasoned C programmer can download `MVSKEL`, add his own application code, and wind up with a program that follows the standard *Multi-Vue* interface provided by Microware and Tandy. At the same time, Griffith has commented his offering quite heavily, making it an ideal learning tool for beginners.

We talked about the importance of a consistent and intuitive user interface at great length during the *KISSDraw* se-

```
09AF
09B0        (* The final structure defines the contents of an entire window.
09F0        (* This includes the title of the window, the number of menus on
0A30        (* the window, the minimum height of the window, the minimum
0A6C        (* width of the window, a special pair of synch bytes and seven
0AAB        (* reserved bytes.  A pointer to an array of menus -- or data of
0AEB        (* the type "mnstr" -- which we just defined.
0B18
0B19        TYPE wnstr=_wnttl:STRING[20]; _nmens,_wxmin,_wymin:BYTE; _wnsync

             :INTEGER; _wnres(7):BYTE; _wnmen:INTEGER
0B4E        DIM WndScr:wnstr
0B57
0B58        (* After we define -- or "type" -- the special data structures
0B96        (* we need for a Multi-Vue based program, we must initialize
0BD2        (* the data in those structures.  We start with the items we
0C0E        (* want to appear on our lone menu.  Notice that we needed to
0C4C        (* add a "null" character or 00 Hex at the end of each string.
0C8A        (* We must do this because Basic09 uses $FF hex to define the
0CC7        (* end of its strings and Multi-Vue expects the "C" style
0D01        (* 00 hex for a delimiter.
0D1B
0D1C        DIM _tanitms(9):Mistr
0D2A        _tanitms(1)._mnttl:="Calc"+EndStr
0D3F        _tanitms(1)._mienbl:=MNEnbl
0D4D        _tanitms(2)._mnttl:="Clock"+EndStr
0D63        _tanitms(2)._mienbl:=MNEnbl
0D71        _tanitms(3)._mnttl:="Calendar"+EndStr
0D8A        _tanitms(3)._mienbl:=MNEnbl
0D98        _tanitms(4)._mnttl:="Control"+EndStr
0DB0        _tanitms(4)._mienbl:=MNEnbl
0DBE        _tanitms(5)._mnttl:="Printer"+EndStr
0DD6        _tanitms(5)._mienbl:=MNEnbl
0DE4        _tanitms(6)._mnttl:="Port"+EndStr
0DF9        _tanitms(6)._mienbl:=MNEnbl
0E07        _tanitms(7)._mnttl:="Help"+EndStr
0E1C        _tanitms(7)._mienbl:=MNEnbl
0E2A        _tanitms(8)._mnttl:="Shell"+EndStr
0E40        _tanitms(8)._mienbl:=MNEnbl
0E4E        _tanitms(9)._mnttl:="Clipboard"+EndStr
0E68        _tanitms(9)._mienbl:=MNDsbl
0E76
0E77        (* Now we'll set up the entire menu
0E9A
0E9B        DIM Tndy_Mn:mnstr
0EA4        Tndy_Mn._mittl:="Tandy"+EndStr
0EB8        Tndy_Mn._mnid:=MN_Tndy
0EC4        Tndy_Mn._mnxsiz:=10
0ECF        Tndy_Mn._mnnits:=9
0EDA        Tndy_Mn._mnenabl:=MNEnbl
0EE6        Tndy_Mn._mnitems:=ADDR(Tndy_Mn)
0EF4
0EF5        (* Now that we have defined the items in the menu and the menu itself,
0F3B        (* we can define the window that we want the menu to appear in.
0F7A
0F7B        WndScr._wnttl:="KISSDraw"+EndStr
0F92        WndScr._nmens:=1
0F9D        WndScr._wxmin:=80
0FA8        WndScr._wymin:=24
0FB3        WndScr._wnsync:=WINSync
0FBF        WndScr._wnmen:=ADDR(Tndy_Mn)
0FCD
0FCE        (* The data structures have all been set up now.  It is time to make a
1014        (* set status call to initialize the window.  We will use _ss_wset.  This
105D        (* call needs three parameters.  The path number, the window type and a
10A5        (* pointer to the data structure defining the window.
10DA
10DB        (* But first, we must turn off the cursor
1104        (* If we don't, we will occasionally write garbage on the
113D        (* screen where we don't want it.  A "gfx2" routine will
1175        (* take care of this for us.
1191        RUN Gfx2(StdOut,"CurOff")
11A4
11A5        (* Now we'll make a SysCall with the Set Window function
11DD        (* code to prove that it works.
11FC
11FD        CallCode:=$8E \(* Set Status Code
1217        Regs.a:=StdOut
1223        Regs.b:=$86 \(* SS.WnSet function code
1248        Regs.x:=ADDR(WndScr)
1256        Regs.y:=WT_FWin
1262
1263        RUN SysCall(CallCode,Regs)
1272        PRINT #StdOut,"Hello <Insert Your Name Here>"
1298        END
129A
```

Editor's note: Due to space restrictions, all portions of `Skipmuf` *are not listed here, but will be continued over the next two months. However, the entire file will appear on this month's* RAINBOW ON DISK.

Listing 2: `Skipmuf`

```
 3    0D  0 (*
 4    0D  0  * Skipmuf - A program for computing the maximum usable
 5    0D  0  * frequency (MUF), highest possible frequency (HPF), and
 6    0D  0  * optimum frequency for traffic (OFT) between two points on
 7    0D  0  * the Earth's surface over a 24-hour period for a specified
 8    0D  0  * date, and Zurich Smoothed Sunspot Number or 10.7 cm Solar
 9    0D  0  * Flux Index.  This program is written for the Tandy Color
10    0D  0  * Computer 3 under the OS-9 Level II Operating System using
11    0D  0  * a high-resolution RGB color monitor.  The algorithm for
12    0D  0  * this program is an adaptation of the MINIMUF 3.5
13    0D  0  * algorithm.  MINIMUF 3.5 is a public domain program in
14    0D  0  * BASIC that was published in the December 1982 issue of
15    0D  0  * QST.  This Pascal program was compiled on the Microware
16    0D  0  * OS-9 Pascal Compiler version 2.00.00.  OS-9 Pascal
17    0D  0  * conforms to the ISO Standard 7185.1 Level 0 (Wirth and
18    0D  0  * Jensen) definition of Pascal.
19    0D  0  *
20    0D  0  * Copyright (c) 1988 by:
21    0D  0  *     John Alan Lind, KD7XG
22    0D  0  *     2194 Conejo Street
23    0D  0  *     Corona, California  91720-4001
24    0D  0  *
25    0D  0  * Release Version 2.1
26    0D  0  *
27    0D  0  * Distributed as "freeware" to the amateur
28    0D  0  * radio community.  If you like this program
29    0D  0  * give it to a friend.  This program may
30    0D  0  * not be sold and the copyright notice must
31    0D  0  * be retained in the program code.
32    0D  0  * Commercial/business use of this software
33    0D  0  * is strictly prohibited.
34    0D  0  *)
37    0D  0 PROGRAM Skipmuf(input, output, screen, printer, infile);
38    0D  0
39    0D  0 CONST
40    0D  0   cursrpos  = 2;  (ASCII value for cursor positioning  )
41    0D  0                   (The two values following this one  )
42    0D  0                   (set the y and x position of the    )
43    0D  0                   (cursor on the terminal screen      )
44    0D  0   scrnoset  = 31; ( Offset value used in placing cursor)
45    0D  0   cls       = 12; (ASCII screen clear character       )
46    0D  0   lineclr   = 3;  (clears line at cursor position     )
47    0D  0   eolclr    = 4;  (clears from cursor to end of line  )
48    0D  0   eoscrcl   = 11; (clears from cursor to end of screen )
49    0D  0   disptime  = 30000;       (loop count for display time    )
50    0D  0   degtorad  = 0.0174532925; (degrees X degtorad = radians  )
51    0D  0   radtodeg  = 57.29577951;  (radians X radtodeg = degrees  )
52    0D  0   window    = '/W';         (OS-9 name for next avail window)
53    0D  0   title = '                          ---= KD7XG OS-9 SKIPMUF =---';
54    0D  0
55    0D  0 TYPE
56    0D  0   monthstr = ARRAY [1..3] OF char;
57    0D  0
58    0D  0 VAR
59    0D  0   printout                : boolean;
60   -1D  0   loopcnt, index, errnum  : integer;
61   -7D  0   mylat, mylon, myalt     : real;
62  -22D  0   olat, olon, oalt        : real;
63  -37D  0   month, day              : real;
64  -47D  0   sunspot, flux           : real;
```

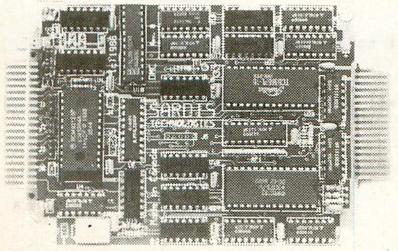
ries. But the topic is so important to the future of the Color Computer and OS-9, it bears mentioning again. This time, we'll quote Griffith:

"Without going too much into the theory of a standard interface, let me say that this is one of the primary reasons so many Macintosh users love their machines. Each application program runs, looks and feels like all the others because they all are used in the same manner. *Multi-Vue* gives us the same capability and, in my opinion, should be taken advantage of."

Griffith's comments are appropriate this month, because we're now starting down a road that we hope will eventually bring a basic understanding of *Multi-Vue* programming to "KISSable OS-9" readers. However, since many readers do not own C, or don't want to learn the language, we plan to see what we can accomplish using the BASIC09 compiler that comes bundled with every copy of OS-9 Level II for the Color Computer.

We attempted to give you a thorough introduction to `GrfInt` programming techniques during our *KISSDraw* series. Now that *Multi-Vue* is readily available, you'll be able to use these skills as you tap the power hidden within `GrfInt`'s replacement, `WindInt`. There's a wealth of information about `WindInt` data structures in the manual that comes with *Multi-Vue*. However, much of it is expressed in the terms of C data structures. We'll start by translating a few of these structures into BASIC09 data types. I'm not sure how far we'll get this month, but hang in there. There's enough material hidden in *Multi-Vue* to sustain you for months.

One of the first things you notice when you look at a C program listing are the `#Include` statements at the beginning. In the case of programs



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using `WindInt` routines, that list often includes these lines:

```
#Include <Wind.h>
#Include <Mouse.h>
#Include <Buffs.h>
#Include. <Stmenu.h.>
```

Additionally, most C programs contain a number of `#Define` statements at the beginning. These statements are used to set the initial value to a number of variables. We can accomplish the same thing with a number of assignment statements (`:=`) in BASIC09.

One starting point, then, is for us to write our own `Wind.h`, `Mouse.h`, `Buffs.h` and `Stdmenu.h` for BASIC09. However, since BASIC09 does not have an `#Include` statement, we'll have to come up with a handy way to include these headers in the beginning of all our programs.

The easiest way to maintain these statements is to store them in a separate text file, which you can load and edit with your favorite text editor. Each time you get ready to create a BASIC09 application program for use with *Multi-Vue*, you can copy these files in at the start of your application program. You might call it a manual `#Include` file. You could call your listings `Wind.b`, `Mouse.b`, `Buffs.b` and `Stdmenu.b` — or bundle them all in one file and call them — `Headers.b`.

When you begin to assemble your BASIC09 application program with your text editor, remember to make the very first character of any file you plan to load into BASIC09 a 'P' or 'p'. In fact, your first line must look something like this:

```
Procedure NameOfApplication
```

As we develop our BASIC09 versions of the C header files, we'll attempt to use the same variable names as those used by the C programmers who wrote *Multi-Vue*. This will make it easier for you to compare your definitions to those in the *Multi-Vue* manual.

We have added liberal comments to this month's project, `MVShell`. Look through this code and compare it to the C code in the *Multi-Vue* manual that carries out a similar task. Then type it in and give it a try. Next month we'll try to type and initialize the data structures for the rest of the standard Tandy menus and show you how to create your own. With a little luck, we'll also be able to bring those menus to life. Till July, enjoy the future! ☐

```
  65   -57D  0   hour, hpf, muf, oft      : real;
  66   -77D  0   answer                   : char;
  67   -78D  0   screen                   : text;
  68  -223D  0   printer                  : text;
  69  -368D  0   infile                   : text;
  70  -513D  0   mo                       : ARRAY [1..12] OF real;
  79  -821D  0 (*
  80  -821D  0  * Dwset - procedure to create a device in a window of
  81  -821D  0  *         type 'sty'.
  82  -821D  0  *)
  83  -821D  0
  84  -821D  0   PROCEDURE Dwset(VAR path:text; sty, cpx, cpy, szx,
  85    -2D  1                  szy, fprn, bprn, bdprn:integer);
  86     0D  1
  87     0D  1   BEGIN
  88     0   2     Write(path,Chr($1B),Chr($20),Chr(sty),Chr(cpx),Chr(cpy),
  89    43   2           Chr(szx),Chr(szy),Chr(fprn),Chr(bprn),Chr(bdprn));
  90    79   2     Prompt(path);
  91    84   2   END;
  94     0   1 (*
  95     0   1  * Font - procedure to specify the get/put buffer from
  96     0   1  *        which to get font data for generating graphics
  97     0   1  *        text.
  98     0   1  *)
  99     0   1
 100     0   1   PROCEDURE Font(VAR path:text; grpnum, bufnum:integer);
 101     0   1
 102     0   1   BEGIN
 103     0   2     Write(path, Chr($1B), Chr($3A), Chr(grpnum), Chr(bufnum));
 104    31   2     Prompt(path);
 105    36   2   END;
 108     0   1 (*
 109     0   1  * Select - procedure to cause the current process' window
 110     0   1  *          to become the active (display) window.
 111     0   1  *)
 112     0   1
 113     0   1   PROCEDURE Select(VAR path:text);
 114     0   1
 115     0   1   BEGIN
 116     0   2     Write(path, Chr($1B), Chr($21));
 117    17   2     Prompt(path);
 118    20   2   END;
 121     0   1 (*
 122     0   1  * Owset - procedure to create an overlay window.
 123     0   1  *)
 124     0   1
 125     0   1   PROCEDURE Owset(VAR path:text;svs,cpx,cpy,
 126     0   1                  szx,szy,prn1,prn2:integer);
 127     0   1
 128     0   1   BEGIN
 129     0   2     Write(path,Chr($1B),Chr($22),Chr(svs),Chr(cpx),Chr(cpy),
 130    43   2           Chr(szx),Chr(szy),Chr(prn1),Chr(prn2));
 131    71   2     Prompt(path);
 132    76   2   END;
 135     0   1 (*
 136     0   1  * Curoff - turns off text cursor.
 137     0   1  *)
 138     0   1
 139     0   1   PROCEDURE Curoff(VAR path : text);
 140     0   1
 141     0   1   BEGIN
 142     0   2     Write(path, Chr($05), Chr($20));
 143    17   2     Prompt(path);
 144    20   2   END;
 147     0   1 (*
 148     0   1  * Scalesw - disables and enables automatic scaling to allow
 149     0   1  *           scaling of full screen to window size or allow
 150     0   1  *           use of absolute coordinates within the window.
 151     0   1  *)
 152     0   1
 153     0   1   PROCEDURE Scalesw(VAR path : text; bsw : integer);
 154     0   1
 155     0   1   BEGIN
 156     0   2     Write(path, Chr($1B), Chr($35), Chr(bsw));
 157    23   2     Prompt(path);
 158    26   2   END;
 161     0   1 (*
 162     0   1  * Setdptr - Sets the draw pointer to the specified coordinates.
 163     0   1  *)
 164     0   1
 165     0   1   PROCEDURE Setdptr(VAR path : text; bx, by : integer);
 166     0   1
 167     0   1   VAR
 168     0D  1     hbx, lbx, hby, lby : integer;
 169    -8D  1
 170    -8D  1   BEGIN
 171     0   2     hbx := bx div $100;
 172     8   2     lbx := bx mod $100;
 173    14   2     hby := by div $100;
 174    20   2     lby := by mod $100;
 175    26   2     Write(path,Chr($1B),Chr($40),Chr(hbx),Chr(lbx),Chr(hby),Chr(lby));
 176    67   2     Prompt(path);
 177    72   2   END;
 180     0   1 (*
181     0   1  * Box - Draws a rectangle defined by by the diagonal line from
182     0   1  *       the current draw pointer position to the specified
183     0   1  *       position.  Draw pointer is NOT updated.
184     0   1  *)
185     0   1
186     0   1   PROCEDURE Box(VAR path : text; bx, by : integer);
187     0   1
188     0   1   VAR
189    0D   1     hbx, lbx, hby, lby : integer;
190   -8D   1
191   -8D   1   BEGIN
192     0   2     hbx := bx div $100;
193     8   2     lbx := bx mod $100;
194    14   2     hby := by div $100;
195    20   2     lby := by mod $100;
196    26   2     Write(path,Chr($1B),Chr($48),Chr(hbx),Chr(lbx),Chr(hby),Chr(lby));
197    67   2     Prompt(path);
198    72   2   END;
201     0   1 (*
202     0   1  * Line - Draws a line from the current draw pointer position to
203     0   1  *        the specified position.  Draw pointer is NOT updated.
204     0   1  *)
205     0   1
206     0   1   PROCEDURE Line(VAR path : text; bx, by : integer);
207     0   1
208     0   1   VAR
209    0D   1     hbx, lbx, hby, lby : integer;
210   -8D   1
211   -8D   1   BEGIN
212     0   2     hbx := bx div $100;
213     8   2     lbx := bx mod $100;
214    14   2     hby := by div $100;
215    20   2     lby := by mod $100;
216    26   2     Write(path,Chr($1B),Chr($44),Chr(hbx),Chr(lbx),Chr(hby),Chr(lby));
217    67   2     Prompt(path);
218    72   2   END;
221     0   1 (*
222     0   1  * Curxy - positions text cursor to specific coordinates.
223     0   1  *)
224     0   1
225     0   1   PROCEDURE Curxy(VAR path : text; x, y : integer);
226     0   1
227     0   1   BEGIN
228     0   2     x := x + $20;
229     7   2     y := y + $20;
230    12   2     Write(path, Chr($02), Chr(x), Chr(y));
231    34   2     Prompt(path);
232    39   2   END;
235     0   1 (*
236     0   1  * Linem - Draws a line from the current draw pointer position to
237     0   1  *         the specified position.  Draw pointer IS updated.
238     0   1  *)
239     0   1
240     0   1   PROCEDURE Linem(VAR path : text; bx, by : integer);
241     0   1
242     0   1   VAR
243    0D   1     hbx, lbx, hby, lby : integer;
244   -8D   1
245   -8D   1   BEGIN
246     0   2     hbx := bx div $100;
247     8   2     lbx := bx mod $100;
248    14   2     hby := by div $100;
249    20   2     lby := by mod $100;
250    26   2     Write(path,Chr($1B),Chr($46),Chr(hbx),Chr(lbx),Chr(hby),Chr(lby));
251    67   2     Prompt(path);
252    72   2   END;
255     0   1 (*
256     0   1  * Fcolor - Sets foreground color.  Argument is the palette
257     0   1  *          register number to use as the color.
258     0   1  *)
259     0   1
260     0   1   PROCEDURE Fcolor(VAR path : text; prn : integer);
261     0   1
262     0   1   BEGIN
263     0   2     Write(path, Chr($1B), Chr($32), Chr(prn));
264    23   2     Prompt(path);
265    26   2   END;
268     0   1 (*
269     0   1  * Curon - turns the text cursor on.
270     0   1  *)
271     0   1
272     0   1   PROCEDURE Curon(VAR path : text);
273     0   1
274     0   1   BEGIN
275     0   2     Write(path, Chr($05), Chr($21));
276    17   2     Prompt(path);
277    20   2   END;
280     0   1 (*
281     0   1  * Owend - Ends the current overlay window by closing it and
282     0   1  *         deallocating system memory used by the window.
283     0   1  *)
284     0   1
285     0   1   PROCEDURE Owend(VAR path : text);
286     0   1
```

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FORMAT: Program submissions must be on tape or disk, and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs and debug our typing errors. All programs should be supported by some editorial commentary explaining how the program works. We also prefer that editorial copy be included on the tape or disk using any of the word processors currently available for the Color Computer. Also, please include a double-spaced printout of your editorial material and program listing. Do not send text in all capital letters; use upper- and lowercase.

COMPENSATION: We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a self-addressed, stamped envelope (SASE) to: Submission Guidelines, THE RAINBOW, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. We will send you comprehensive guidelines.

Please do not submit material currently submitted to another publication.

```
   0  1   BEGIN
   0  2     Write(path, Chr($1B), Chr($23));
  17  2     Prompt(path);
  20  2   END;
   0  1 (*
   0  1  * Log10 - returns base 10 logarithm for real or
   0  1  *         integer argument.  Value returned is real.
   0  1  *)
   0  1
   0  1   FUNCTION Log10(x : real) : real;
   0  1
   0  1   VAR
  0D  1     l, err : real;
-10D  1     result : real;
-15D  1     e      : integer;
-17D  1
-17D  1     PROCEDURE Norm(x : real; VAR e : integer; VAR z : real);
  0D  2
  0D  2     VAR
  0D  2       k : integer;
 -2D  2
 -2D  2     BEGIN
   0  3       k := 0;
   4  3       IF x >= 1 THEN
  13  4         WHILE x >= 10 DO BEGIN
  22  5           k := k + 1;
  26  5           x := x/10
  29  5         END
  35  5       ELSE
  41  4         WHILE x < 1 DO BEGIN
  50  5           k := k - 1;
  54  5           x := 10 * x;
  63  5       END;
  66  3     e := k;
  69  3     z := x;
  74  3     END;
   0  2
   0  2   BEGIN
   0  2     IF (x = 1.0) THEN
  15  3       result := 0
  15  3     ELSE BEGIN
  23  3       Norm(x, e, x);
  33  3       l := 0;
  38  3       err := 1;
  43  3       result := e;
  48  3       REPEAT
  48  3         x := x * x;
  58  4         err := err/2;
  67  4         IF x >= 10 THEN BEGIN
  76  5           l := result;
  82  5           x := x/10;
  91  5           result := l + err;
 101  5         END;
 101  4       UNTIL ((err < 6.0e-39) OR ((result = 1) AND (result <> 0)));
 129  3     END;
 129  2     Log10 := result;
 135  2   END;
   0  1 (*
   0  1  * Clrscrn - Clears the screen and leaves the header behind.
   0  1  *)
   0  1
   0  1   PROCEDURE Clrscrn(VAR path:text);
   0  1
   0  1   BEGIN
   0  2     Curxy(path, 0, 2);
   8  2     Write(path, Chr($0B));
  16  2     Prompt(path);
  19  2   END;
   0  1 (*
   0  1  * Logo - print program logo on screen
   0  1  *)
   0  1
   0  1   PROCEDURE Logo(VAR path:text);
   0  1
   0  1   CONST
  0D  1     disptime = 30000;
  0D  1
  0D  1   VAR
  0D  1     loop1, loop2 : integer;
 -4D  1
 -4D  1   BEGIN
   0  2     Page(path);
   5  2     Writeln(path, 'OS-9 SKIPMUF v 2.1');
  18  2     Writeln(path, 'Copyright (c) 1988');
  31  2     Writeln(path, 'by John Alan Lind, KD7XG');
  44  2     Writeln(path, 'Corona, California');
  57  2     Writeln(path);
  62  2     Writeln(path, 'Distributed as "freeware" to the amateur');
  79  2     Writeln(path, 'radio community.  If you like this program');
  96  2     Writeln(path, 'give it to a friend.  This program may');
 113  2     Writeln(path, 'not be sold and the copyright notice must');
 130  2     Writeln(path, 'be retained in the program code.');
 147  2     Writeln(path, 'Commercial/business use of this software');
 164  2     Writeln(path, 'is strictly prohibited.');
```

```
387   179   2     FOR loop1 := 1 to 2 DO
388   191   3       FOR loop2 := 1 to disptime DO;
389   233   2   END;
392     0   1 (*
393     0   1  * Header - procedure to clear screen and place
394     0   1  *          program title header at the top.
395     0   1  *)
396     0   1
397     0   1   PROCEDURE Header(VAR path:text);
398     0   1
399     0   1   CONST
400    0D   1     title = '                   ---- KD7XG OS-9 SKIPMUF ----';
401    0D   1
402    0D   1   BEGIN
403     0   2     Page(path);
404     5   2     Writeln(path, title);
405    20   2     Writeln(path);
406    25   2   END;
409     0   1 (*
410     0   1  * Init - procedure to read configuration file and
411     0   1  *        initialize program with user's callsign,
412     0   1  *        station location, etc.
413     0   1  *)
414     0   1
415     0   1   PROCEDURE Init;
416     0   1
417     0   1   VAR
418    0D   1     index      : integer;
419   -2D   1
420   -2D   1   BEGIN
421     0   2     Reset(infile, 'config_muf');
422    14   2
423    14   2     FOR index := 1 TO 10 DO
424    24   3       call[index] := Chr(0);
425    50   2     index := 1;
426    52   2     WHILE NOT eoln(infile) AND (index <= 10) DO BEGIN
427    65   3       Read(infile, call[index]);
428    81   3       index := Succ(index);
429    84   3     END;
430    87   2     Readln(infile);
431    92   2
432    92   2     FOR index := 1 TO 20 DO
433   102   3       name[index] := Chr(0);
434   128   2     index := 1;
435   130   2     WHILE NOT Eoln(infile) AND (index <= 20) DO BEGIN
436   143   3       Read(infile, name[index]);
437   159   3       index := Succ(index);
438   162   3     END;
439   165   2     Readln(infile);
440   170   2
441   170   2     Readln(infile, mylat);
442   182   2
443   182   2     Readln(infile, mylon);
444   194   2
445   194   2     { next line is data not used by this program, but is }
446   194   2     { embeded to allow altitude use in future software   }
447   194   2     { that will use the same configuration file.         }
448   194   2
449   194   2     Readln(infile, myalt);
450   206   2
451   206   2     FOR index := 1 TO 3 DO
452   216   3       printpath[index] := Chr(0);
453   242   2     index := 1;
454   244   2     WHILE NOT Eoln(infile) AND (index <= 3) DO BEGIN
455   259   3       Read(infile, printpath[index]);
456   275   3       index := Succ(index);
457   278   3     END;
458   281   2     Readln(infile);
459   286   2     Close(infile);
460   291   2   END;
463     0   1 (*
464     0   1  * Menu - procedure to select distant location for
465     0   1  *        computation of MUF.
466     0   1  *)
467     0   1
468     0   1   PROCEDURE Menu(VAR path:text);
469     0   1
470     0   1   VAR
471    0D   1     loopcount, index, choice : integer;
472   -6D   1     test : ARRAY [1..16] OF char;
473  -22D   1
474  -22D   1   BEGIN
475     0   2     test := '*** EOF         ';
476     9   2     FOR index := 8 TO 16 DO
477    21   3       test[index] := Chr(0);
478    46   2     REPEAT
479    46   2       Reset(infile, 'skipmuf_dat');
480    58   3       Clrscrn(path);
481    62   3       loopcount := 0;
482    64   3       FOR index := 1 TO 16 DO
483    76   4         ocntnt[index] := Chr(0);
484   102   3       index := 1;
485   104   3       WHILE NOT Eoln(infile) AND (index <= 16) DO BEGIN
486   117   4         Read(infile, ocntnt[index]);
```

About Your Subscription

Your copy of THE RAINBOW is sent second class mail. You must notify us of a new address when you move. Notification should reach us no later than the 15th of the month prior to the month in which you change your address. Sorry, we cannot be responsible for sending another copy when you fail to notify us.

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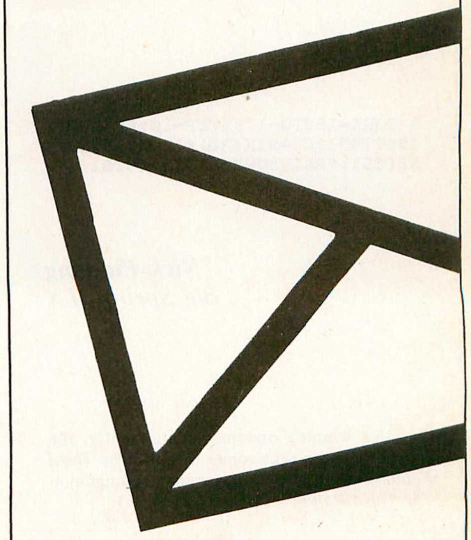

One-Liner Contest Winner . . .

This one-liner prints insert cards for your cassette boxes. Just load and run while your printer is online. When the printer stops, type `PRINT#-2,A$` (this is a one-liner, you know, and can hold only so much) to finish the program. Then cut out your card and fold it, and it's ready to document the contents of your cassette.

The listing:

```
1 A$=STRING$(41,"."):PRINT#-2,A$
:PRINT#-2,":S1";:FORX=1TO17:PRIN
T#-2," ";:NEXT:PRINT#-2,":S2":B$
=STRING$(19," "):FORX=1TO14:PRIN
T#-2,":";B$;":";B$;":":NEXT:PRIN
T#-2,A$:PRINT#-2:PRINT#-2:PRINT#
-2,A$:FORX=1TO6:C$=STRING$(39,"
"):PRINT#-2,":";C$;":"
2 NEXT
```

Keith Selbee
Akron, OH

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

One-Liner Contest Winner . . .

Catch the wave! The sine wave, that is. Run this short program and watch THE RAINBOW waving to you via the magic of trigonometry. If that gets boring, edit in your name and wave to yourself.

The listing:

```
1 FORA=180TO-179STEP-10:RD=A/57.
29577951:CL=SIN(RD)*12+12:PRINTT
AB(CL);"RAINBOW":NEXTA:GOTO1
```

Nick Fladung
Big Spring, TX

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

```
487   133   4         index := Succ(index);
488   136   4       END;
489   139   3       Readln(infile);
490   144   3       REPEAT
491   144   3         loopcount := Succ(loopcount);
492   147   4         Write(path, loopcount:2, '.  ');
493   164   4         Rightjust(FALSE);
494   168   4         Write(path, ocntnt:16, ' - ');
495   188   4         Rightjust(TRUE);
496   192   4
497   192   4         FOR index := 1 TO 20 DO
498   204   5           ocity[index] := Chr(0);
499   230   4         index := 1;
500   232   4         WHILE NOT Eoln(infile) AND (index <= 20) DO BEGIN
501   245   5           Read(infile, ocity[index]);
502   262   5           index := Succ(index);
503   265   5         END;
504   268   4         Readln(infile);
505   273   4         Write(path, ocity, ', ');
506   293   4
507   293   4         FOR index := 1 TO 20 DO
508   305   5           ocntry[index] := Chr(0);
509   331   4         index := 1;
510   333   4         WHILE NOT Eoln(infile) AND (index <= 20) DO BEGIN
511   346   5           Read(infile, ocntry[index]);
512   362   5           index := Succ(index);
513   365   5         END;
514   368   4         Readln(infile);
515   373   4         Writeln(path, ocntry);
516   388   4
517   388   4         Readln(infile, olat);
518   400   4         Readln(infile, olon);
519   412   4         Readln(infile, oalt);
520   424   4
521   424   4         FOR index := 1 TO 16 DO
522   438   5           ocntnt[index] := Chr(0);
523   466   4         index := 1;
524   468   4         WHILE NOT Eoln(infile) AND (index <= 16) DO BEGIN
525   481   5           Read(infile, ocntnt[index]);
526   497   5           index := Succ(index);
527   500   5         END;
528   503   4         Readln(infile);
529   508   4       UNTIL (ocntnt = test);
530   520   3       Close(infile);
531   525   3       Writeln(path);
532   534   3       Write(path, 'Select area of the world for prediction:  ');
533   550   3       Prompt(path);
534   553   3       Reset(path);
535   563   3       Readln(path, choice);
536   579   3       Rewrite(path);
537   589   3     UNTIL ((choice >= 1) AND (choice <= loopcount));
538   599   2
539   599   2     Reset(infile, 'skipmuf_dat');
540   611   2     FOR loopcount := 1 TO (choice - 1) DO BEGIN
541   627   3       Readln(infile);
542   632   3       Readln(infile);
543   637   3       Readln(infile);
544   642   3       Readln(infile);
545   647   3       Readln(infile);
546   652   3       Readln(infile);
547   657   3     END;
548   671   2
549   671   2     FOR index := 1 TO 16 DO
550   685   3       ocntnt[index] := Chr(0);
551   713   2     index := 1;
552   715   2     WHILE NOT Eoln(infile) AND (index <= 16) DO BEGIN
553   728   3       Read(infile, ocntnt[index]);
554   744   3       index := Succ(index);
555   747   3     END;
556   750   2     Readln(infile);
557   755   2
558   755   2     FOR index := 1 TO 20 DO
559   771   3       ocity[index] := Chr(0);
560   799   2     index := 1;
561   801   2     WHILE NOT Eoln(infile) AND (index <= 20) DO BEGIN
562   814   3       Read(infile, ocity[index]);
563   830   3       index := Succ(index);
564   833   3     END;
565   836   2     Readln(infile);
566   841   2
567   841   2     FOR index := 1 TO 20 DO
568   855   3       ocntry[index] := Chr(0);
569   883   2     index := 1;
570   885   2     WHILE NOT Eoln(infile) AND (index <= 20) DO BEGIN
571   898   3       Read(infile, ocntry[index]);
572   914   3       index := Succ(index);
573   917   3     END;
574   920   2     Readln(infile);
575   925   2
576   925   2     Readln(infile, olat);
577   937   2     Readln(infile, olon);
578   949   2     Readln(infile, oalt);
579   961   2     Close(infile);
580   966   2   END;
```

```
    0  1 (*
    0  1  * Getdat - gets data from the user: date, sunspot number
    0  1  *          or solar flux index, etc.
    0  1  *)
    0  1
    0  1 PROCEDURE Getdat(VAR path:text);
    0  1
    0  1 CONST
   0D  1   disptime = 30000;
   0D  1
   0D  1 VAR
   0D  1   choice,choice1,choice2 : integer;
  -6D  1   loop1,loop2 : integer;
 -10D  1
 -10D  1 BEGIN
    0  2   REPEAT
    2  2     Clrscrn(path);
    6  3     Write(path, 'Enter prediction month (1 - 12):  ');
   18  3     Prompt(path);
   21  3     Reset(path);
   31  3     Readln(path, choice1);
   41  3     Rewrite(path);
   51  3   UNTIL ((choice1 > 0) AND (choice1 < 13));
   61  2   month := choice1;
   66  2   moname := moarray[choice1];
   84  2
   84  2   REPEAT
   84  2     Clrscrn(path);
   88  3     Writeln(path, 'Enter prediction month (1 - 12):  ', choice1:2);
  108  3     Write(path, 'Enter prediction day(1 - ', mo[choice1]:2:0, '):  ');
  149  3     Prompt(path);
  152  3     Reset(path);
  162  3     Readln(path, choice2);
  174  3     Rewrite(path);
  184  3   UNTIL ((choice2 > 0) AND (choice2 <= mo[choice1]));
  210  2   day := choice2;
  215  2
  215  2   REPEAT
  215  2     Clrscrn(path);
  219  3     Writeln(path, 'Use:');
  234  3     Writeln(path, '1.  Sunspot number');
  249  3     Writeln(path, '2.  Solar Flux Index');
  267  3     Write(path, 'Enter 1 or 2:  ');
  279  3     Prompt(path);
  282  3     Reset(path);
  292  3     Readln(path, choice);
  304  3     Rewrite(path);
  314  3   UNTIL ((choice = 1) OR (choice = 2));
  324  2
  324  2   IF (choice = 1) THEN BEGIN
  330  3     REPEAT
  330  3       Clrscrn(path);
  334  4       Write(path, 'Enter Zurich Smoothed Sunspot Number (SSN >= 0):  ');
  348  4       Prompt(path);
  351  4       Reset(path);
  361  4       Readln(path, sunspot);
  373  4       Rewrite(path);
  383  4     UNTIL (sunspot > 0.0);
  396  3     IF (sunspot = 0.0) THEN
  409  4       flux := 65.0
  409  4     ELSE
  421  4       flux := ((0.0008 * (sunspot * sunspot)) + (0.73 * sunspot) + 65.0);
  456  3     Writeln(path, 'Equivalent Solar Flux Index is:  ', flux:3:0);
  481  3     END
  481  3   ELSE BEGIN
  484  3     REPEAT
  484  3       Clrscrn(path);
  488  4       Write(path, 'Enter 10.7cm Solar Flux Index (flux >= 65):  ');
  502  4       Prompt(path);
  505  4       Reset(path);
  517  4       Readln(path, flux);
  533  4       Rewrite(path);
  543  4     UNTIL (flux >= 65.0);
  556  3     IF (flux = 65.0) THEN
  569  4       sunspot := 0.0
  569  4     ELSE
  581  4     sunspot := 625.0 * (Sqrt(0.5329 - (0.0032 * (65.0 - flux))) - 0.73);
  624  3     Writeln(path, 'Equivalent Sunspot Number is:  ', sunspot:3:0);
  653  3   END;
  653  2   FOR loop1 := 1 TO 2 DO
  667  3     FOR loop2 := 1 TO disptime DO;
  711  2 END;
```

About The One-Liner Contest . . .

THE RAINBOW's One-Liner Contest has now been expanded to include programs of either one or two lines. This means a new dimension and new opportunity for those who have "really neat" programs that simply just won't fit in one line.

Here are the guidelines: The program must work in Extended BASIC, have only one or two line numbers and be entirely self-contained — no loading other programs, no calling ROM routines, no poked-in machine language code. The program has to run when typed in directly (since that's how our readers will use it). Make sure your line, or lines, aren't packed so tightly that the program won't list completely. Finally, any instructions needed should be *very* short.

Send your entry (preferably on cassette or disk) to:

THE RAINBOW
One-Liner Contest
P.O. Box 385
Prospect, KY 40059

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The retail stores listed below carry THE RAINBOW on a regular basis and may have other products of interest to Tandy Color Computer users. We suggest you patronize those in your area.

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	News Room
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Davie	Software Plus More
Ft. Lauderdale	Bob's News & Book-Store
	Clarks Out of Town News
	Mike's Electronics Distributor
Gainesville	Paper Chase
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	Indiana News
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KANSAS

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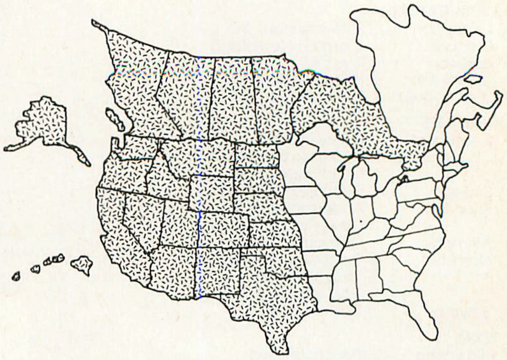

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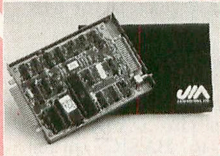

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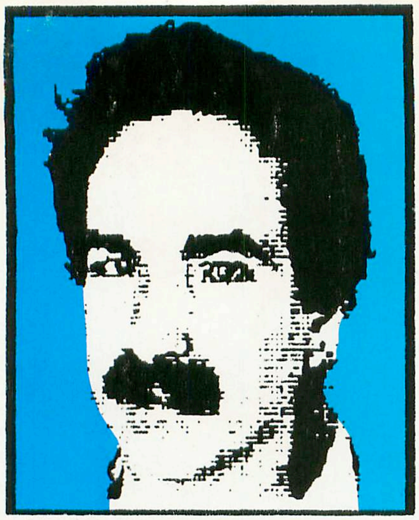
For Color Computer Software
Since 1983



Dear Friends,

Thank you. 1988 marks our fifth year of providing quality software for the Color computer. Only your support has made it possible. So, from our hearts, Peg and I thank you. And remember our promise--If you buy it from us, we support it. If you are unhappy for any reason, send it back for a full refund within 30 days of purchase.

Pyramix

This facinating CoCo 3 game continues to be one of our best sellers. Pyramix is 100% machine language written exclusively to take advantage of all the power in your 128K CoCo 3. The Colors are brilliant, the graphics sharp, the action fast. Written by Jordon Tsvetkoff and a product of Color-Venture.

The Freedom Series

Vocal Freedom

I've got to admit, this is one nifty computer program. Vocal Freedom turns your computer into a digital voice or sound recorder. The optional **Hacker's Pac** lets you incorporate voices or sounds that you record into your own BASIC or ML programs. This is not a synthesizer. Sounds are digitized directly into computer memory so that voices or sound effects sound very natural. One "off-the-shelf" application for Vocal Freedom is an automatic message-minder. Record a message for your family into memory. Set Vocal Freedom on automatic. When Vocal Freedom "hears" any noise in the room, it plays the pre-recorded message! Disk operations are supported. VF also tests memory to take advantage of from 64K up to a full 512K. Requires low cost amplifiler (RS cat. #277-1008) and any microphone.

Mental Freedom

Would your friends be impressed if your computer could read their minds? Mental Freedom uses the techniques of Biofeedback to control video game action on the screen. Telekinesis? Yes, you control the action with your thoughts and emotions. And, oh yes, it talks in a perfectly natural voice without using a speech synthesizer! Requires Radio Shack's low cost Biofeedback monitor, Cat. #63-675.

BASIC Freedom

Do you ever type in BASIC programs--manually, I mean. If you do, you know it can be a real chore. Basic Freedom changes all that. It gives you a full screen editor just like a word processor, but for BASIC programs. Once loaded in, it is always on-line. It hides invisibly until you call it forth with a single keypress! This program is a must for programers or anyone who types in programs. By Chris Babcock and a product of Color-Venture.

Lightning Series

These three utilities give real power to your CoCo 3.

Ramdisk Lightning

This is the best Ramdisk available. It lets you have up to 4 mechanical disk drives and 2 Ram drives on-line and is fully compatible with our printer spooler below.

Printer Lightning

Load it and forget it--except for the versatility it gives you. Never wait for your printer again! Printer runs at high speed while you continue to work at the keyboard!

Backup Lightning

This utility requires 512K. Reads your master disk once and then makes superfast multiple disk backups on all your dirves! No need to format blank disks first! Supports 35, 40 or 80 track drives.

Prices

CoCo 3 only

Ram Disk Lightning, Disk	$19.95
Printer Lightning Disk	$19.95
Backup Lightning, Disk	$19.95
All three, Disk	$49.95
Pyramix, Disk	$24.95

CoCo 1,2, or 3

Vocal Freedom, Disk	$34.95
Vocal Freedom Hackers Pac	$14.95

CoCo 2 or 3 only

Mental Freedom, Disk	$24.95
Basic Freedom, Disk	$24.95

CoCo 1 or 2 only

VDOS, The Undisk, ramdisk for the CoCo 1 or 2 only, Tape	$24.95
VDUMP, backup Undisk files to single tape file, Tape	$14.95
VPRINT, Print Undisk directory, Tape	$9.95

Everyone

Add $2.50 shipping/handling in USA or CANADA

Add $5.00 to ship to other countries

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